

# ENERGY AUDIT REPORT APRIL-2023

#### Submitted To: Children'S University

Located at: Subhash Chandra Bose Shixan Sankul, Chh-5, Children's University, Sector 20, Gandhinagar, Gujarat 382021



Submitted By: Excel Enviro Tech (NABL & NABET Accredited) TF-2, Sun House, Near Old High Court, Off Ashram Road, Ahmedabad – 380 009; +91-9825588910, 9825729124 www.excelenviro.com;info@excelenviro.com



# **CERTIFICATE**

This is to certify that We Excel Enviro Tech located at TF-2, Sun House, Old high court lane, Near Income Tax, Ahmedabad-380009, has successfully completed Energy Conservation Audit(Energy Audit) of **Children's University** located at : Subhash Chandra Bose Shixan Sankul, Chh-5, Children's University, Sector 20, Gandhinagar, Gujarat 382021, in the month of April-2023.

**Company Seal** 

**Authorized Signatory** 

**Excel Enviro Tech** 

# **INTRODUCTION OF CHILDREN'S UNIVERSITY**

#### **About Us:**

- The children of today have to be prepared to become builders of the future, the future which would be marked by replacement of competitive individualism by the synthesis of individual liberty, collective egalitarianism and universal and spiritual fraternity;
- The future will be liberated from disabling scepticism and from comforting arrestation of quest of knowledge, and progress will be accelerated by ardent aspirations to realise higher spiritual truths and their manifestation in physical life;
- The new world of the future will cultivate material life so as to make it prosperous and rich and it will replace poverty wherever it exists by elimination of drudgery, exploitation and slavery and encourage nobility, dignity and continuous empowerment.

The children's university will lead the children of today to build a new world of friendliness, mutuality and harmony that transcends all barriers of narrowness and blind conflicts resulting from exclusivism and burden of the past that strives to linger against the pressure of the future of uplifting light and prosperity.

#### Vision

#### The Vision of Children's University is three-dimensional.

- To develop Bharatiya stream of knowledge and lifestyle by achieving five-layered development of children.
- To make children realize the higher spiritual truths.
- To augment knowledge capita by preparing children for substantial researches along with building and creating their sublime character and self-pride.

#### **Objectives**

- To re-create the teaching pedagogical structure by integrating the guidance of globally acclaimed academicians.
- To create human beings inspired by nationalistic zeal and patriotism.
- To inculcate ethical and cultural values in children.
- To establish Bharat as an academic power of the world by integrating the knowledge of antiquity and modernity.
- To prepare a child in multiple talents, science and technology and thereby, to inspire the one for the purpose of nation-building.

## The Vision of Children's University is three-dimensional.

- 1. To develop Bharatiya stream of knowledge and lifestyle by achieving fivelayered development of children.
- 2. To make children realize the higher spiritual truths.
- **3.** To augment knowledge capita by preparing children for substantial along with building and creating their sublime character and self-pride.

# **Objective:**

## The objects of the University shall be as follows: -

(1) to study and undertake research in the works of pioneering educationists of Gujarat, India as also of other parts of the world, who have underlined the need for child-centred holistic education so as to derive guidance from the same;

(2) to promote the fundamental duties laid" down in article 51A of the Constitution of India;

(3) to foster in the University highest purposes of education of the body, life, and mind as also of the human spirit in its integrity;

(4) to promote synthesis of scientific realism and artistic creativity;

(5) to recover the lights from lessons of ancient wisdom in the context of modern developments; Establishment and Incorporation of University. Headquarters Of University. Objects of University. PART-IV] GUJARAT GOVERNMENT GAZETTE, EX., 31-7-2009 16-4

(6) to establish facilities, programmes and activities of research, education, training, and extension services that promote all levels of child's development, including at the primary and secondary levels of education;

(7) to introduce and nurture innovations in the education system so as to reflect India's spiritual knowledge, robust intellectuality and inexhaustible creativity;

(8) to study and derive lessons from the ongoing experiments of education that are taking place

in Gujarat as also elsewhere and to foster all the valuable innovative work and promote the same for larger expansion and utilization.

# **EXCEL ENVIROTECH CONSULTANCY PROFILE**

Excel Enviro Tech (EET) is a progressive organization specialized from year 2002. EET is in the field of environmental consultancy for environment clearance from MoEF & SEAC, Consent to Establish (NOC) and Consent to Operate (CCA) from GPCB, Effluent Treatment Plant Design, Operation and Maintenance of Treatment Plant. EET has obtained ISO:45001:2018 certification for Health & Safety system.

EXCEL ENVIROTECH (EET) provides specialty-consulting services in Environment Management, Risk Assessment and Health & Safety. The company has a team of professional engineers and scientists, with extensive accumulated experience in all aspects of environmental engineering.

EET has installed full-fledge testing laboratory, for monitoring and analysis in the areas of ambient air, water, Noise, Fuel, soil, microbiological parameters and hazardous waste. For establishing the confidence in the work done, the laboratory has got the **PRESTIGIOUS RECOGNIZATION FROM MOEFCC as Gazette Laboratory;** and Accreditation from **NABL for more than 400 parameters**.

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	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	21	5 (f)	A	Issue Date:	18/11/2022	KOILEN . INDIA . ST	Valid Until:	17/11/2024
	Common hazardous waste treatment, storage and disposal facilities	32	7 (d)	В	This certificate remain	ins valid for the Sco	ope of Accreditation as	specified in the annexure	e subject to continued
)	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B	satisfactor	y compliance to th	e above standard & the	relevant requirements o	f NABL.
1	Building and Construction Projects	38	8 (a)	В	(To see the se	cope of accreditation of	this laboratory, you may also	o visit NABL website www.nal	bl-india.org)
2	Townships and Area development Projects	39	8 (b)	В				-	
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? Ac I-NA red	creditation shall remain in force subject to continued compliance to the term BET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/22/2297 itation needs to be renewed before the expiry date by Excel Enviro Tech, Ahn ssment.	ns and con dated A nedabad f	ditions ment April 04, 20. ollowing due	ioned in 22. The process		Signer	d for and on behalf	of NABL	
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Sr. I	Director, NABET Certificate No.		Valid up	o to					

# **Details of Consumer**

Name of Consumer : Children's University, Gandhinagar. Name of Consumer as per Bill : CHILDREN UNIVERSITY Name of Contact Person : Mrs. Denisha Madam E-mail Address : estate@cugujarat.ac.in :99 KW Contract Demand : Commercial Purpose of Consumer Consumer Service No. :954666 : Torrent Power Name of Supplier Office Period of Audit : April 2023

#### General

Globalization has made tremendous changes in the world & concept of Energy Conservation left behind by doing Energy Audits. Energy saved is Energy Generated the global mantra now in this world. Energy is essential to life & its conservation has become as absolute necessity. The requirement of energy has gone up in last few years & would touch unimaginable preparation of population explosion & improvement of living standards.

#### Energy Audits mean lot of things & common meaning are:

- Using less Energy in particular application
- Finding ways to purchase particular form of energy at lower cost. This is usually accomplished by negotiation with energy providers.
- Shifting to different energy resources at lower costs.
- Using "Free or Renewable" energy sources that considered being more desirable, or less undesirable, with regards to non efficiency concerns such as availability and pollution. Conservation of Water, Fuels & Materials, a well as energy sources.
- Considerable efforts are required by all sectors of society. Constant R & D is also required towards improving the Thermal Efficiency of the building, Electrical equipments, Industrial process, Heating & Cooling equipments.
- A lot of experience knowledge and hard work required for energy conservations. The most important is that everyone has to keep himself abrest with the latest and emerging technologies to incorporate in industry.

# **Electrical System Profile**

Customer ID: 954666 Supply Type: Three Phase Sanctioned Load: 99.000 kW Billing Demand: 84.500 kW

# **ELECTRICITY BILL SUMMARY**

Sr. No.	Month	RKVAH	MDKW Maximum Demand Value	Energy (Consumed Units)	Total Bill Amount (Rs.)	Energy charges (Rs./kwh)
1	Apr-22	868	57.1	8992	83300	9.26
2	May-22	672	64.7	4813	93230	19.37
3	Jun-22	970	58.2	13224	116030	8.77
4	Jul-22	662	68.2	9556	89520	9.36
5	Aug-22	50	72.6	8068	78230	9.69
6	Sep-22	84	52.2	8122	78640	9.68
7	Oct-22	98	63.0	8198	80040	9.76
8	Nov-22	88	53.2	4382	50690	11.56
9	Dec-22	104	32.4	4552	52000	11.42
10	Jan-23	126	28.6	4626	53720	11.61
11	Feb-23	98	26.2	4262	50840	11.92
12	Mar-23	70	25	5240	58,610	11.18
Av	erage	324	50.11	7002	73737	11.13

#### **Observation:**

Average Monthly Electricity bill of Children University is Rs. 73737/- monthly and average unit Consumption is 7002 monthly. Actual max. demand & monthly consumption varies significantly due to change in demand. The average energy charge is Rs. 11.13/-kwh, which include Max. demand charges TOU charges, FPF & Government duty charges.

# **Energy Demand Pattern**



# **Energy Consumption Pattern**



#### **Power Factor:**

Normally Induction motors are characterized by power factors less than unity, leading to lower overall efficiency associated with plant electrical system. The impact of PF correction includes reduced Kva demands & hence reduced utility demand charged. It also reduced I<sup>2</sup>R losses in cable in upstream & reduces voltage drop in cables. It should be noted that Capacitor improve power factor from the point of installation back to generation side. The size of capacitor required for particular motor depends upon the no load reactive KVA drawn by motor.

**Conclusion:** The average power factor as per billing system is very good and nothing do change anything accept monitoring of the same.

#### Adverse Effects of Over Compensation / Leading PF

- Extra Power loss in Capacitors. Transformer losses Increased, which requires higher capacity than the required to supply the same Kw load.
- Over heating of the Cable & Switch gear that increases cablelosses.
- The current would be higher which puts extra stress on the LT switchgear reducing the useful life of the switchgear & Cables.
- Voltage will increase at the point of common coupling of capacitors. So the higher the kvar, the higher voltage at the point of capacitors installation.

#### Monitoring and Metering System

**Roll of Proper Metering System:** A large amount of electricity being handled by electrical department in industry, even 1 % of electrical saving in losses would provide substantial financial benefits to utilities. To release the benefits, a systematic approach to install energy monitoring metering system at number of places. Development of comprehensive energy accounting system would enable quantification of loss in different segments of the system and their segregation. Proper and accurate meters, metering system and practice are essential for effective and correct energy accounting. It also gives the needs of the management Information's systems for adopting Continuous Energy accounting, which is the bonus to the management.

**Observations:** Mostly LT 3 ph – 4 wire energy meters are at the most placed at the Main LT panel. These meters provided the Voltage/Current/Energy to monitor plant electrical equipment parameters at Main Panel. A hand held clip-on meter is also used for measuring the power consumption data. The total energy consumption is taken out on License meter only. As these reading are taken manually and calculating is laborious task and create errors. Installation of Microprocessor based instrumentation at load feeders and respective feeders helps complete monitoring the energy consumption. This meter provides kW, volt, ampere, PF, and cumulative energy consumption. This will also remove to maintain the logbook and necessary removal of electromechanical meters and their maintenance.

#### **Objectives of Energy Accounting**

- Identifications of high-energy consumption areas.
- Identification for losses due to equipments.
- Line losses caused by resistance of Conductor of cable.
- Weak and inadequate & UN planed net working.
- Transformer and regulator losses. [Copper & No load loss] Die electric losses in underground cables.
- Power factor losses due to poor power factor in downstream equipment.
- Inadequate reactive compensation at load points.
- Voltage droop & over load loss.
- Incorrect operation of machine
- Increasing the load by installation of excessive size of motors.

Conclusion: Any energy conservation goal will be successful only when all the employees in the office will involve. To full fill the task for energy accounting, Engineers are motivated for energy accounting scheme effectively & trained appropriately and encourage their support and give them awards for their energy saving initiative. It can therefore be seen that taking an Energy Audits will be extremely beneficial to all consumers whether it is Industries, Hotels or domestic consumers. Energy audit are one of those happy tasks which while leading to immediate improvement in the profitability and economic viability of the industries. It also benefit to the nation to use scarce resources more efficiently.

#### **Harmonics**

**Major causes of Harmonics:** Devices that draw non-sinusoidal currents when a sinusoidal voltage is applied create harmonics. Frequently these devices develop that convert AC to DC. However, in real life situation varies devices like, diodes, silicon control rectifiers, PWM system, Thyrister, Voltage & Current chopping Induction & Arc furnaces, are also deployed for various requirements and due to varying impedance characteristics. These non-liner loads caused distortion in voltage and current wave forms, which is of increasing concern indecent time. Harmonic occurs as spikes at interval which are multiples of the main supply frequency and these distorted the pure sine wave from of the supply voltage & current.

Harmonics are multiples of fundamental frequency of an electrical power system. Example The fundamental frequency is 50 Hz, and then the 5<sup>th</sup> harmonic is 5 timesthat frequency or 250 Hz. Likewise, 7<sup>th</sup> harmonic is seven times of fundamental or350 Hz and so on for higher order Harmonics. Harmonics can be discussed in terms of Current and Voltage. A 5<sup>th</sup> Harmonic currentis simply a current flowing at 250 Hz on 50 Hz system. The 5<sup>th</sup> Harmonic current flowing through system, Impedance creates a 5<sup>th</sup> harmonic Voltage. Harmonic isexpressed in Terms of Total Harmonic Distortion [THD]. When harmonic current flowin system they are known as **"poor power quality" or "Dirty power"** Other causes ofpoor power quality includes Transient such as voltage Spike, Surges, Sags & ringing. Because they repeat in each cycle, Harmonies are regarded as steady state cause of poor quality power.

#### Adverse Effects of Harmonics in System

- Blinking of Incandescing light –Transformer Saturation.
- Capacitor failures Harmonics Resonance.
- Circuit Breaker failure, heating of Switches gear & Cable Inductive heating
- Electronic Equipment Failure Voltage Distortion.
- Flickering of tub light & pre-matured failures Transformer Saturation.
- Fuses blown off & tripping of MCBs Inductive heating.
- Failures of Motors [over heating ] Voltage drops
- Neutral Conductor & terminal failure Inductive heating
- Power Interference on Voice Communication Harmonic Noise
- Overheating in Transformers Inductive heating

**Solutions for Harmonics:** Distortion in Voltage and current waveform is not desirable in electrical network, because of their adverse impact on connected equipments. It is there for prudent to installed tuned harmonic filters close to loads generating harmonics current. Harmonic current is filtered at the source reliving the network from evil effect of harmonic. The harmonic filters are Capacitors bank connected in series with reactor. The required reactor value is calculated based on load & housed in cubical panel with suitable switch gear. The filter system injects required inductive Kvar to the network to improve power factor below the harmonic frequency and beyond harmonic frequency. Thus, prevent amplification of harmonics.

DESCRIPTION		M	AIN	
DESCRIPTION	R	Y	B	Ν
V(L)	390	389	392	
V (Ph)	224	215	237	
AMP.	63.8	112.9	45.5	42.1
Hz		50	0.01	
KW	14.45	19.45	10.75	
KVAR	0.78	1.95	1.51	
KVA	14.52	21.30	10.86	
P.F	0.99	0.99	0.99	
%V	2.3	2.9	1.8	
%A	3.6	4.9	6.1	

#### ✤ MAIN I/C :

- Above table mentions the data collection at the Main incomer with all three phases.
- Load in very much in unbalance condition and it is expected as well looking to the major single phase loads. However, we recommend to distribute the AC and other motive load in three phases.
- All other electrical parameters are within limit like current and power factorand harmonics in current and voltage.
- Supply voltage level is little lower and hence need to monitor for further reduction. Need to keep in the range of 415 v AC.
- It seems that due to some past failure experience the fuse is removed from the Y phase which is dangerous and hence recommend to replace the hardwire with proper rating of fuse to avoid future accident.

## **\* RECEPTION AND ADMIN AREA DB :**

DESCRIPTION		MAL	N	
DESCRIPTION	R	Y	В	Ν
VOLT	219	213		
AMP.	1.7	1.4	0	
KW	0.34	0.24		
KVAR	0.08	0.14		
KVA	0.37	0.30		
P.F	0.91	0.84		
%V	2.4	2.8		
%A	14.4	18.6		

□ Parameters are within limit.

#### **CONTINUES AREA DB** :

DESCRIPTION		MAI	N	
DESCRIPTION	R	Y	В	Ν
VOLT	222	209	238	
AMP.	1.8	9.9	13.8	
KW	0.38	2.0	3.2	
KVAR	0.07	0.38	0.61	
KVA	-0.38	2.0	3.3	
P.F	0.99	0.99	0.97	
-%V	2.4	3.0	1.8	
%A	9.0	5.9	7.8	

□ Parameters are within limit.

#### **MEETING ROOM G 10 :**

DESCRIPTION		MAL	N	
DESCRIPTION	R	Y	В	Ν
VOLT	214	240	215	
AMP.	1.6	5.4	4.8	
KW	0.29	1.26	1.0	
KVAR	0.08	0.23	0.21	
KVA	0.35	1.29	1.0	
P.F	0.83	0.97	0.99	
%V	2.9	1.9	2.3	
%A	54.5	14.3	11.5	

□ Parameters are within limit.

# CLERK ROOM G 8:

DESCRIPTION		MAL	N	
DESCRIPTION	R	Y	В	Ν
VOLT	243			
AMP.	1.7	0	0	
KW	0.27			
KVAR	0.10			
KVA	0.37			
P.F	0.72			
%V	1.9			
%A	80.0			

□ Parameters are within limit except current harmonics.

## **COMPUTER LAB :**

DESCRIPTION		MAL	N	
DESCRIPTION	R	Y	В	Ν
VOLT		203	225	
AMP.	0	14.6	2.3	
KW		2.92	0.41	
KVAR		0.50	0.25	
KVA		2.99	0.50	
P.F		0.97	0.82	
%V		3.4	3.0	
%A		30.6	23.3	

□ Parameters are within limit.

## **\* PSYCHOLOGY LAB DB :**

DESCRIPTION		MA	IN	
DESCRIPTION	R	Y	В	Ν
VOLT	225	206	245	
AMP.	10.6	2.6	5.8	
KW	2.38	0.52	1.40	
KVAR	0.15	0.12	0.22	
KVA	2.40	0.54	1.41	
P.F	0.98	0.95	0.98	
%V	2.1	2.8	1.9	
%A	8.1	15.3	6.3	

# **\*** VIDHYAVATIKA :

DESCRIPTION		MAL	N	
DESCRIPTION	R	Y	В	Ν
VOLT		232		
AMP.	0	5.5	0	
KW		1.22		
KVAR		0.34		
KVA		1.28		
P.F		0.95		
%V		2.0		
%A		13.8		

□ Parameters are within limit.

## **\* BOREWELL** :

DESCRIPTION	MAIN	
VOLT	396	
AMP.	23.3	
KW	14.89	
KVAR	6.18	
KVA	16.17	
P.F	0.92	
%V	1.9	
%A	3.8	

□ Parameters are within limit.

# **Conclusive Remarks**

- Generally LED lights have been installed in the institute. We recommend to change normal tube light with LED as per latest requirement. However, we understood that the new building coming and hence implement the energy saving options from installation itself.
- Some of the area of building has very nice concept for Day lights, provisions of adequate windows for Lighting and air changes for energy saving.
- It is recommended to fix solar system in the campus area for energy conservation.
- Install motion sensors in passages and wash rooms and office cabins. This will help toreduce unnecessary power consumption in area and payback is within One year.
  - Recommend to use roof top solar system at premise. The normal payback periodis with 4 years. We estimated that at least 30 KW system is possible and the investment will be in the range of INR 15,00,000/-. This will help to maintain the electricity bill within saving mode.
- Install pump run hour meters to monitor the running hours and water consumption in new working building.

# **ANNEXURE SECTIONS**

# Annexure -1 Photographs of Campus





#### **Annexure -2 Electricity Bill**



#### **Annexure -3 Energy Saving Tips**

- > Turn Off Your Lights
- > Unplug your electronics and make it a habit.
- > Invest In a Programmable Thermostat
- Reduce water wastage
- Wash cloths & hands Wisely
- Recycle your waste
- Reduce fuel usage
- > Take advantage of natural sunlight.
- Switch to LED Lightbulbs
- Invest in *energy-saving* power strips
- Use sensors for lights
- Maintain law brightness to reduce energy consumption

