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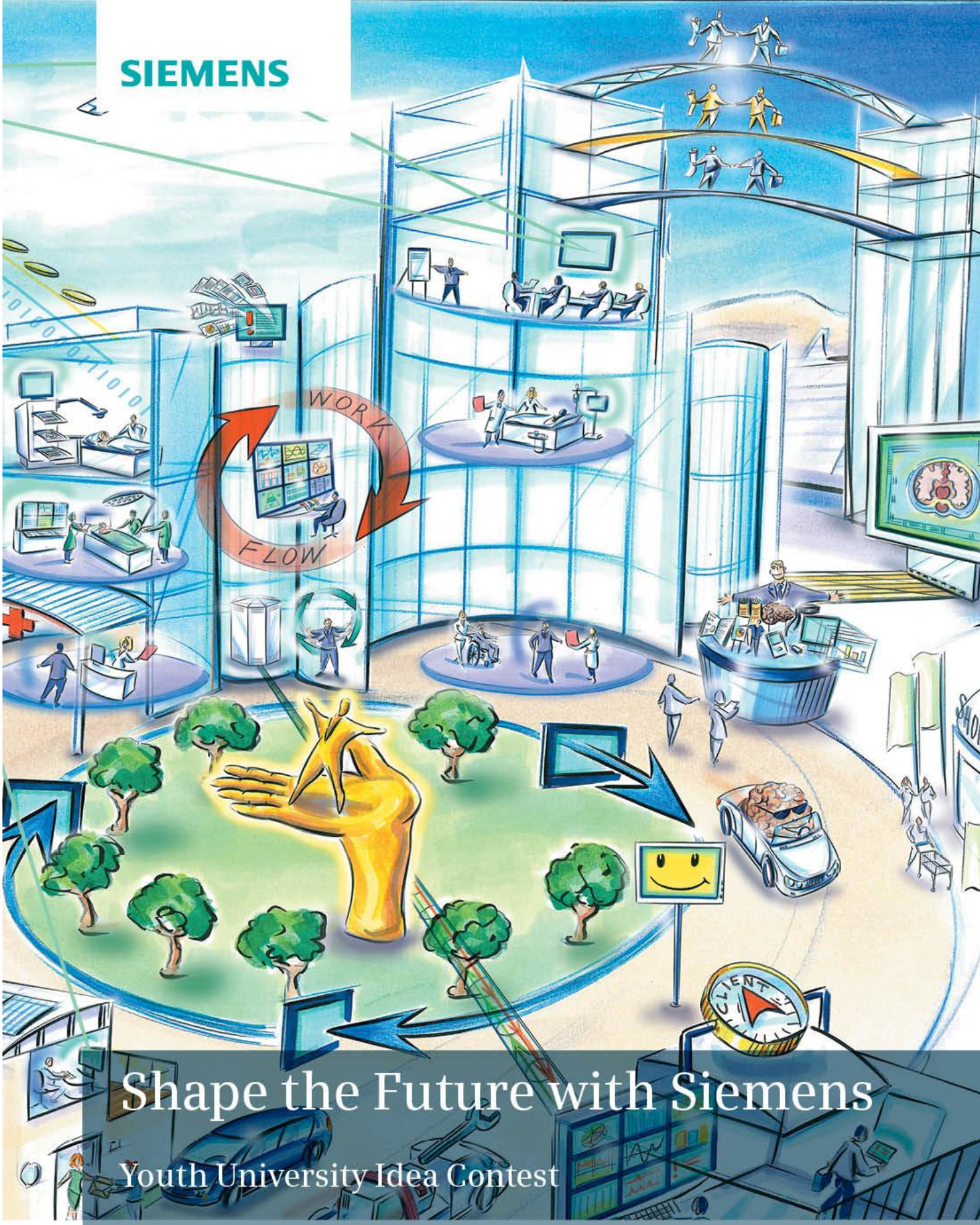

Shape the Future with Siemens

Youth University Idea Contest

Guidelines

www.siemens.co.in/ideacontest

Eligibility:

- All participants must be bona fide students in their 3rd / 4th year from Engineering Colleges in India.
- Team members can be from different Engineering Colleges in India.

Instructions:

- Choose one of the four challenges listed alongside.
- Use this template to articulate your idea to address the challenge you chose.
- Use font Arial 11 pt with 1.25 line spacing.
- Your submission must contain the four mandatory sections and must not exceed the page limits for each section.
- Use the References section to mention sources of information used in your idea.
- If required you may attach necessary supporting diagrams in an optional fifth section called Annexure.
- Save this document with a file name <Challenge Area>_<City of College>_<First Name of Primary Team Contact>.
- Your entry should be e-mailed to contact.sisl.in@siemens.com / abhijit.goldar@siemens.com / azhivannan.r@siemens.com
- The last date to send your entry is **June 15, 2012.**
- Good luck.

Challenge Area:

1. **Energy**
   Cities consume 75 percent of the world's energy. Approximately 70 million people move into cities every year. India's energy consumption is estimated to grow by five percent every year. The transmission and distribution losses in India are over 30 percent of the total energy produced. The acute power shortage has resulted in protracted power cuts across the country. At the same time, demand for energy in Indian cities is continually rising.
   How would you shape the future of Energy?

2. **Transportation**
   Transportation is a challenge in Indian cities. It is insufficient and the quality is inadequate. In addition, city roads are congested, which slows down travel. With the population of cities continually increasing, the volume of traffic is only going to rise, further complicating the situation.
   How would you shape the future of Urban Transportation?

3. **Water**
   Less than one half of a percent of water on earth is available as fresh water. Global consumption of water is doubling every 20 years, more than twice the rate of human population growth. 60 percent of the drinking water in the globe is consumed in cities. In India, an average of 150 liters/person/day of water is consumed in cities. In most areas, water is supplied for only a few hours every day. In addition, only 30 percent of the total waste water is treated.
   How would you shape the future of Water Management?

4. **Healthcare**
   70 percent of India's population lives in rural areas. However, over 80 percent of India's healthcare infrastructure is available in its cities. Moreover, lifestyle diseases are on the rise in addition to prevailing challenges like infant mortality, tuberculosis, and water-borne epidemics.
   How would you shape the future of Healthcare?

Entry Details

Challenge Area*	Energy
Title of the proposed Idea / Solution*	**India Energized**
Team Name*	**Parivartan**

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Course*	
Year / Semester	
College*	

** mandatory*

Problem Description
(Max. 1 page)

Cities have always been the **driving force behind the development of human civilization** even as far back as the time of the Indus Valley Civilization. During that time, cities were **mostly built around rivers and places where natural resources were available** in abundance. With the **advent of industrialization**, this has changed and now with the development of faster and more efficient means of transportation **old cities never run out of steam** and keep on bearing the weight of a **burgeoning population**. This phenomenon, known as urbanisation, has led to the current situation where **75% of the world's energy needs are that of cities**.

Due to this scenario, it becomes essential to develop most plans taking into account the energy consumption by cities.

India currently suffers from a major shortage of electricity generation capacity, even though it is the **world's fourth largest energy consumer** after United States, China and Russia [6]. Most places in India witness **load shedding** at a frequent basis. This is a major **hindrance to India's development**. Electricity is basic necessity for a country's industrial growth; it is the blood that keeps modern day cities running. The **International Energy Agency** estimates India needs **an investment of at least $135 billion** to provide universal access of electricity to its population.

India's **transmission and distribution losses are more than 30%** of the total electricity generated, against the **world average of less than 15%**. This is due to **obsolete equipment** being used by Indian electricity distribution companies and also due to considerable amount of **electricity theft** due to lack of proper governance and means of detection of unaccountable electricity losses. Even though India has an **installed capacity of almost 200 GW**, only about **130 GW of electricity is available** even in the best of times [5]. Table [1] in the Annexure lists the losses in transmission in India vis-à-vis other nations.

To accelerate the **development of the industrial, commercial, and agricultural sectors** to meet India's growth aspirations, energy sector is of critical importance**.** Our solution addresses both the problems at the heart of India's energy woes, the gap between the energy requirement and generation and the loss in power transmission.

Even though India possesses immense natural gas and coal reserves, one may question why we have focused on **renewable solutions**. The reason for our choice is that when the world is switching towards renewable sources of energy, if India continues with **conventional sources of energy**, it would be a very **short-term solution** to the problem at hand.

India also has immense potential for developing solar, wind and hydro power plants. India's **western region** receives a lot of **sunlight** and contains various **sparsely populated regions**. India's **coastal areas** are home to **strong winds** which can be harnessed to provide cheap and clean wind energy. Also, the presence of various **perennial rivers** gives us the opportunity to develop hydro power **stations** that can provide uninterrupted energy.

Solution Description
(Max. 2 pages)

The present level of annual energy consumption in India is about 330 Million Tonnes Oil Equivalent for the year 2004. Accordingly, the per capita consumption is about 305 kilogram oil equivalent. Though, the current level of energy consumption by world standard is low, **Energy intensity**, which is energy consumption per unit of GDP**, is one of the highest in comparison to other developed and developing countries**.

Due to fast depleting coal and natural gas reserves there is an urgent need to exploit non- conventional sources of energy.

· **Biogas plants-** Biogas has a **potential of generating 12 million MW** but the current usage is **limited to 3.8 million MW**. To boost usage of this non- conventional source it is necessary for the government to interfere and impose regulations such as:

1. Guarantee the producers of renewable energy that it would be fed into public power grid, thus ensuring that none of the power produced goes wasted.
2. Providing **a fixed compensation** to promote setting up of biogas plants.
3. **Use of barren land** for such purposes so that agricultural productivity is not affected.

· **Solar Power plants-** The daily average solar energy incident over India varies from 4 to 7 kWh/m2. India's western region has huge potential for solar power. Solar energy can be tapped by the following:

1. Promoting **solar farms** in India, i.e., huge tracts of sparsely populated land that can be used entirely for the purpose of developing solar power plants.
2. Distributing **solar lanterns** in remote locations which have not been electrified.
3. Using unconventional ways to increase solar power generation, such as installation of **solar panels on top of tall buildings**, as a **covering for canals** which also reduces the loss of water through evaporation.

Apart from exploiting the non-conventional energy sources, there is a need for efficient management of energy. Energy efficiency is by far the fastest, cheapest, and largest untapped solution for saving energy.

The following model caters to the energy demands of the future:

We not only try to reduce power consumption but the focus is also on tapping new devices for generation of electricity inside the buildings which reduces transmission losses as well**.**

Green Buildings should be offered **tax incentives** and major cities which already face a very high electricity demand such as Delhi, Mumbai, Bangalore, etc. should have legislations which make **energy efficient building design compulsory** in all new buildings.

1) Reducing power consumption within a building-

· **Passive solar building design-** Buildings can be built to exploit the seasonal variations in the sun's path to convert sunlight into usable heat and also cause air movement to facilitate ventilation.

- In this design, windows, walls, and floors are made to collect, store, and **distribute solar energy in the form of heat in the winter and reject solar heat in the summer.**
- It **does not involve the use of mechanical and electrical devices** so there is no added electrical energy requirement for the same.
- **65-70% of the solar radiation** (that strikes the collector) can be converted into useful heat by direct gain systems.
- Lower room temperatures would also **reduce the pressure on air conditioning**, thereby lowering energy requirements.

· **Energy efficient lighting systems-** 1/5th of electricity consumptions is through lighting. **Effective lighting systems** also provide additional economic value by preserving the resource base and reducing pollution. Some of the steps that can be taken to ensure efficient lighting are as follows-

- Use of **High Intensity Discharge (HID)** lights for large indoor areas. They produce intense light at high efficacy and can save 75%–90% of lighting energy when they replace incandescent lamps.
- Installing window films and adding insulation or reflective roof coating to reduce energy consumption.
- Use of infrared movement detectors to switch on and off lights.

2) Finding ways to generate electricity within the given perimeter

· **Use of energy harvesting floor tiles-**The Pavegen floor tiles use the kinetic energy of a footstep to strain a piezoelectric material. This strain produces a voltage, which when integrated into a circuit can be used to produce green electricity. This electricity can then be used to light LED's or can be stored in batteries.

- Pavegen claims that each tile is able to generate **4-8 watts of electricity per footstep**, with 5% used to power the tiles LED lighting and 95% left over as usable electricity.
- These tiles have **a lifespan of 5 years** after which they **can be recycled** in sections thus reducing disposal needs.

Various **small dams** can be constructed in mountainous regions which will **help in powering nearby villages** and make them independent in terms of energy requirements.

Since, a huge amount of electricity generated in India is lost in the form of **transmission and distribution losses**, no plan for making India empowered in the energy sector can be drafted without taking it into consideration:

- All the above ideas need to be enforced along with a **robust distribution system** that looks into thefts and **transmission losses due to obsolete equipment**.
- Today over 21% (theft apart!!) of the total electrical energy generated in India is lost in transmission (4-6%) and distribution (15-18%). The electrical power deficit in the country is currently about 18%.[4]

Why do you think your solution will work?
(Max. 1 page)

India is blessed with an abundance of sunlight, water, and biomass. This huge reservoir makes it possible to work in the direction of harvesting renewable energy out of natural resources. Although the process requires huge initial costs and large areas of land, it is possible to work in this field with the intervention of the government.

Also, we have the technological know-how since these plants are already running in different parts of the country, albeit sparsely distributed. So, establishment and running of solar and biogas plants will not be a problem.

With the world moving towards green energy and the increasing awareness among people regarding protection of environment, the day is not far when the entire world will depend on renewable sources of energy.

Developing countries are setting the pace on investing in the energy use of their buildings, the Energy Efficiency Indicator survey found. According to the survey, 74% in India said they planned to increase investments in energy efficiency or renewable energy. 85% rely on energy management to boost operational efficiency, up 34 percentage points from the Energy Efficiency Indicator survey conducted two years ago. These results show that the concern is shifting towards efficiency rather than operation.

Passive solar building design-

- The percentage of the required heat load met by this design is around 5-25% for modest systems, 40% for highly optimized systems and 75% for very intense systems.
- This technique may have a higher installation cost but the energy requirements are very low leading to lower annual energy and maintenance costs.

Energy harvesting floor tiles-

- Pavegen known for its durability has a lifespan of about five years in which the installation costs can be recovered.
- The tiles can be recycled, which further reduces the cost involved in their production

Reducing transmission and distribution losses is a small step which will go a long way in making India more energy efficient. Renovating all obsolete transmission equipment can be done at a fraction of the cost of setting up a power plant and would be equally beneficial. At least 15-20% more energy could be made available through this small step.

Good governance would also help in cutting down losses due to theft. This does not require a lot of money, but more of administrative willingness for improved law and order.

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(Max. 1 page)

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3. Investigating the feasibility of implementing Pavegen energy harvesting piezoelectric floor tiles in the new SUB- UBC Social Ecological Economic Development Studies (SEEDS) Student Report. http://mynewsub.com/site/wp-content/uploads/2010/08/APSC261_2A_NewSUBAtrium_PavegenSteps_Group021.pdf

4. http://www.iitk.ac.in/infocell/Archive/dirmar1/power_distribution.html

5. “Load Generation Balance Report”, Central Electricity Authority, Government of India, Ministry of Power

6. “India: Overview, Data and Analysis”. U.S. Energy Information Administration. 2011. http://www.eia.gov/countries/cab.cfm?fips=IN

7. “Transmission and Distribution Losses (Power)”, TERI

Annexure
(Optional)

Country	T&D losses percent	Country	T&D losses percent
Japan	4.0	Switzerland	6.0
Denmark	4.0	Sweden	6.4
Germany	4.0	United States	7.0
Ghana	4.0	United Kingdom	7.0
Singapore	4.0	Taiwan	7.0
Guam	4.50[a]	Italy	7.4
Macau	4.81[a]	London	8.3
Korea	5.4	Malaysia	10.0
France	5.9	Thailand	10.3
Australia	6.0	Fiji	10.52[a]
Canada	6.0	Indonesia	12.0
China	6.0	Mexico	14.0
South Africa	6.0	Hong Kong	15.0

[a]Source is Electric Power in Asia and Pacific, United Nations, 1997

Source. World Development Report 1997, and London Electricity of UK

Table 1

State / Region	Energy				Peak			
	Requirement	Availability	Surplus(+)/ Deficit (-)		Demand	Met	Surplus(+)/ Deficit (-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
Northern	279581	249145	-30436	-10.9	41000	36140	-4860	-11.9
Western	287757	256237	-31520	-11.0	42422	37781	-4641	-10.9
Southern	250024	223814	-26210	-10.5	37247	31859	-5388	-14.5
Eastern	105461	97294	-8167	-7.7	17171	15185	-1986	-11.6
North-Eastern	10918	10884	-34	-0.3	2198	2068	-130	-5.9
All India	**933741**	**837374**	**-96367**	**-10.3**	**136193**	**118676**	**-17517**	**-12.9**

Table 2: Electricity deficit in various regions of India [5]