Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Energy Storage & E-Vehicle Mgt **Semester: III**

Program: MBA Power Mgt **Time : 03 hrs.**

Course Code: PIPM 8011P **Max. Marks: 100**

Instructions:

SECTION A

10Qx2M=20Marks (Attempt all Questions)

S. No.		Marks	CO
Q 1	Name the countries where abundant Cobalt is being found.	**2**	**CO1**
Q 2	Which Charging technology is slowest?	**2**	**CO1**
Q 3	What is Energy Density?	**2**	**CO1**
Q 4	Name 2 PSP projects in India.	**2**	**CO1**
Q 5	What is FDRE?	**2**	**CO1**
Q 6	What is Ramp up rate wrt Storage Technologies.	**2**	**CO1**
Q 7	Out of all battery technologies which type have highest Energy Density.	**2**	**CO1**
Q 8	Why should India go for Hydrogen Based Economy?	**2**	**CO1**
Q 9	What is regenerative braking system?	**2**	**CO1**
Q 10	What is the tariff rate for E-Vehicle charging in state of Uttarakhand?	**2**	**CO1**

SECTION B

4Qx5M= 20 Marks (Attempt all Questions)

Q 1	Explain the process of Energy storage with proper diagram.	**5**	**CO2**
Q 2	Explain Super Magnetic Energy Storage technology.	**5**	**CO2**
Q 3	What steps can be undertaken to increase the CUF of a Solar project?	**5**	**CO2**
Q 4	Why DISCOMs should install ESS or leverage use of ESS?	**5**	**CO2**

SECTION-C

3Qx10M=30 Marks (Attempt all Questions)

Q 1	Analyze the technical parameters which will help us in identifying the right ESS technology for installation and usage.	**10**	**CO3**
Q 2	Critically analyze Public Charging station guidelines given by Govt. of India.	**10**	**CO3**
Q 3	"India should go for E-Vehicle". Critically analyze and explain the statement	**10**	**CO3**

SECTION-D

2Qx15M= 30 Marks

Go through the case and answer the questions at the end

Energy Storage Technology: The Current Landscape

The drive toward net zero is one of the defining policy areas and a key technological challenge for nearly every government and industry in the world. Transforming the global energy grid from one heavily reliant on fossil fuels to a renewable energy network is vital to avoid the worst effects of climate change.

Many major economies, such as the US, China, and the EU have announced increased funding for renewables and energy storage technology projects to meet this changing demand and ensure energy security. In the UK, £32.9 million of funding was announced in late 2022 to develop new energy storage technologies.

Several reports published recently attest to the growing global interest in energy storage technologies. For instance, The Carbon Trust has commissioned a study to address critical questions surrounding future energy storage in the UK. The European Commission regularly publishes guidance for EU member states.

Grid-scale manufacture of battery technologies in countries such as Germany, the US, and Australia is underway, and the World Economic Forum has predicted that thermal energy storage systems will triple in size by 2030 to meet demand. Storing excess power generation for downtime periods is essential to ensure a secure grid.

The current energy storage technology landscape is complex and constantly evolving, requiring a holistic approach. Technology, policy, funding, and multiple industries and governmental agencies must be considered to ensure continued peak capacity and energy security as the world transitions to net zero carbon emissions.

Energy Storage Technology: The Problems

Energy storage technology can be broadly separated into electrical, thermal, and fuel technologies. Concerning renewable energy generation, the main storage solutions are batteries, fuel cells, and supercapacitors. Efficient and reliable storage solutions are needed for the energy and transportation industries.

One of the main challenges in the energy industry at the moment is how to meet peak demand for renewables. Solar and wind generation, for instance, fluctuates seasonally, with weather conditions such as cloud cover interrupting solar energy generation.

Another challenge is the availability of rare earth minerals. Batteries, for example, make heavy use of lithium, a finite resource. Moreover, lithium extraction is environmentally challenging, causing negative effects such as groundwater and soil contamination, toxic waste, and water resource depletion.

Rare earth minerals, essential for all types of energy storage technology, are largely controlled by a minority of world economies, such as China, Chile, and Australia. This makes their supply highly vulnerable to sensitive geopolitical and economic issues.

Yet another issue with energy storage technology is one of grid design. Historically, electricity grids were not designed for storage, as fossil fuels are burned year-round to generate electricity. Scaling up storage, typically with electrochemical batteries, remains highly challenging to meet constant and growing energy demand.

To overcome these and several other challenges associated with the transition to a green, sustainable global energy grid, new technologies will need to be researched, funding will need to be increased, and the political will must exist to improve the energy storage technology sector.

Energy Storage Technology: The Future

Efficient and reliable energy storage is central to meeting the demands of modern industry as it transitions to a sustainable, renewable, and carbon-neutral model. However, key challenges persist with energy storage technology which must be urgently addressed to avoid critical bottlenecks.

As the world transitions to a net zero, post-carbon economy, novel and innovative energy storage solutions will be required, likely utilizing new materials from areas such as nanotechnology.

One future direction is the emerging market in developing nations for energy storage, which can reduce their overall electricity costs while providing environmental benefits at a local and global level. Additionally, policies could concentrate on local consumption, providing incentives for consumers.

If the world is to successfully mitigate anthropogenic climate change, there will need to be an increased focus on renewables and alternative fuels. Energy storage technology should be a central part of keeping society's wheels turning as it continues to transform into a green economy over the coming decades.

Q 1	What are the Geo-political issues mentioned in the case and how to resolve it?	**15**	**CO4**
Q 2	Evaluate the case study if it was India mentioned in the case study	**15**	**CO 4**