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AHA

PRESENTATION ON

ADVANCING FROM DG TO PV & DG PV ONLINE CALCULATOR

By: Pulkit Dhingra

Founder & Director

AHAsolar Pvt. Ltd. (the "AHA")

27 Nov. 2020, Ahmedabad, GJ, INDIA

Ver 1.0

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- About Replace of DG by PV
- Purpose of the Study
- Market Analysis of DG
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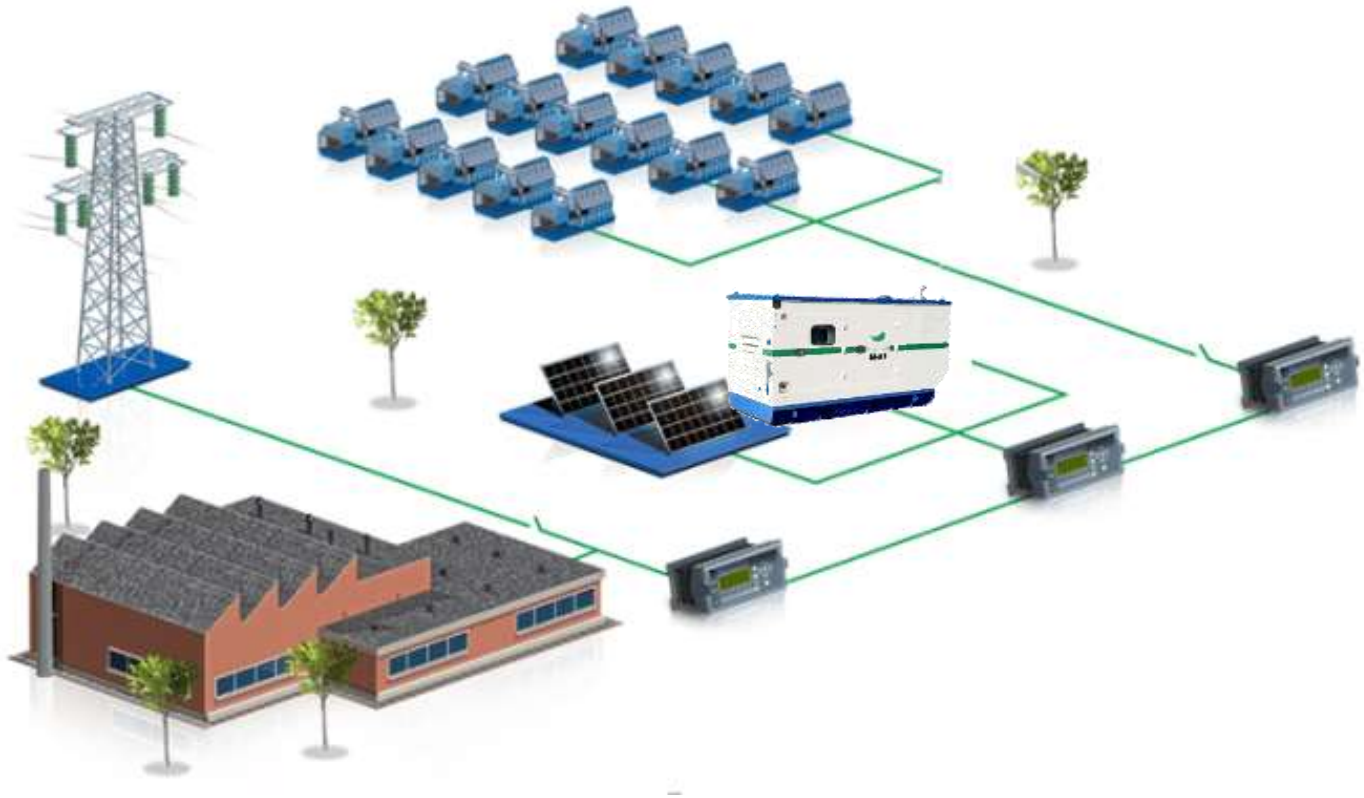


Our Journey

EVENTS	DATES
Inception of Idea of AHA! Rooftop Solar Helper	October, 2015
Research Project of "AHA! Rooftop Solar Helper" Mobile App made live	March, 2016
Launch of Beta version of AHA! Rooftop Solar Helper Mobile App by Joint Secretary, MNRE, GoI	September, 2016
Inauguration of "AHA! Solar Jharkhand" Mobile App/ Portal by Secretary, Energy Department, GoJ	June, 2017
Inauguration of "AHA! Solar Gujarat" Portal for Gujarat Energy Development Agency (GEDA) & GiZ	September, 2018
Received Start-up India recognition by Department for Promotion of Industry and Internal Trade (DPIIT), GoI	March, 2019
Developed and Launch Digital Platform for managing World's Biggest Rooftop Solar Programme of 3200MW by 2020 for GUVNL & GIZ	September, 2019
Launch of AHA! Solar Helper Pro for EPC Company and Consultants	December, 2019
Developed All in One Software for EPC	June, 2020
Developed Online Tool to size PV for DG Replacement	August, 2020
Received Award for RE Digital Champion of the Year	November, 2020

Overview of AHA! Solar

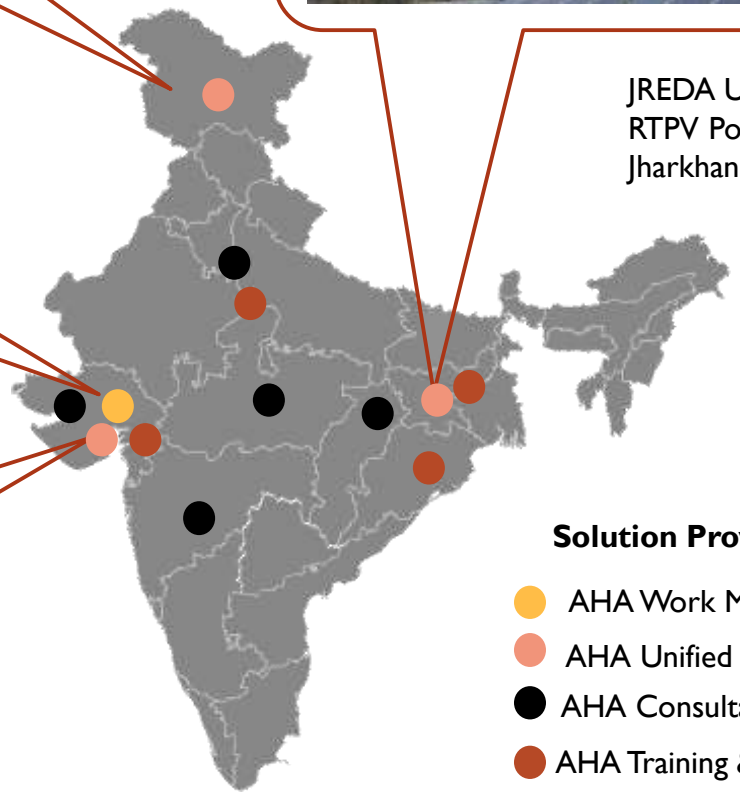
Portfolio: **4** RTPV Govt. Digital Solution; **100+** AHA EPC Clients; **1.5 Lacs** Consumers of AHA Platform; Presence in **5** States

J&K Unified RTPV Portal

JREDA Unified RTPV Portal of Jharkhand

GEDA Unified RTPV Portal of Gujarat

Surya Gujarat Unified RTPV Portal of Gujarat



Solution Provided by AHA

- AHA Work Management Solutions
- AHA Unified Solution
- AHA Consultancy Projects
- AHA Training & e-Learning

- **Founded** in 2017
- **2GW** Advisory Experience for Utility Scale & RTPV Solar Project
- Fully Integrated **Digital Platform** Solution for Distributed Solar
  - Project Management; Design; Sales tracking & Subsidy Management
- Managing Projects of
  - **700 MW** Rooftop Projects
- In-house **AI-based tools** for Shadow Analysis & Design Software
- Trained **1000+** Solar Professionals

Our Clients

Government Clients

Ministry of New and Renewable Energy Government of India

सत्यमेव जयते
Energy & Petrochemicals Department
Government of Gujarat

GUVNL

सौर ऊर्जा

GEDA

GERMI

JREDA

INDIAN RAILWAYS

Development Corporations

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

UNDP

Corporates/ Consulting Firms

renac renewables academy

EY

KPMG

NEXUS ENERGYTECH PVT LTD

Solar Companies

Grace® Go Green, Go Solar

MEC MECpower solutions Pvt. Ltd.

evotar

JANSA SOLAR SOLUTION PVT LTD

JJ SOLAR Right Decision - Bright Future

SOLEX

Z

100+ B2B Companies

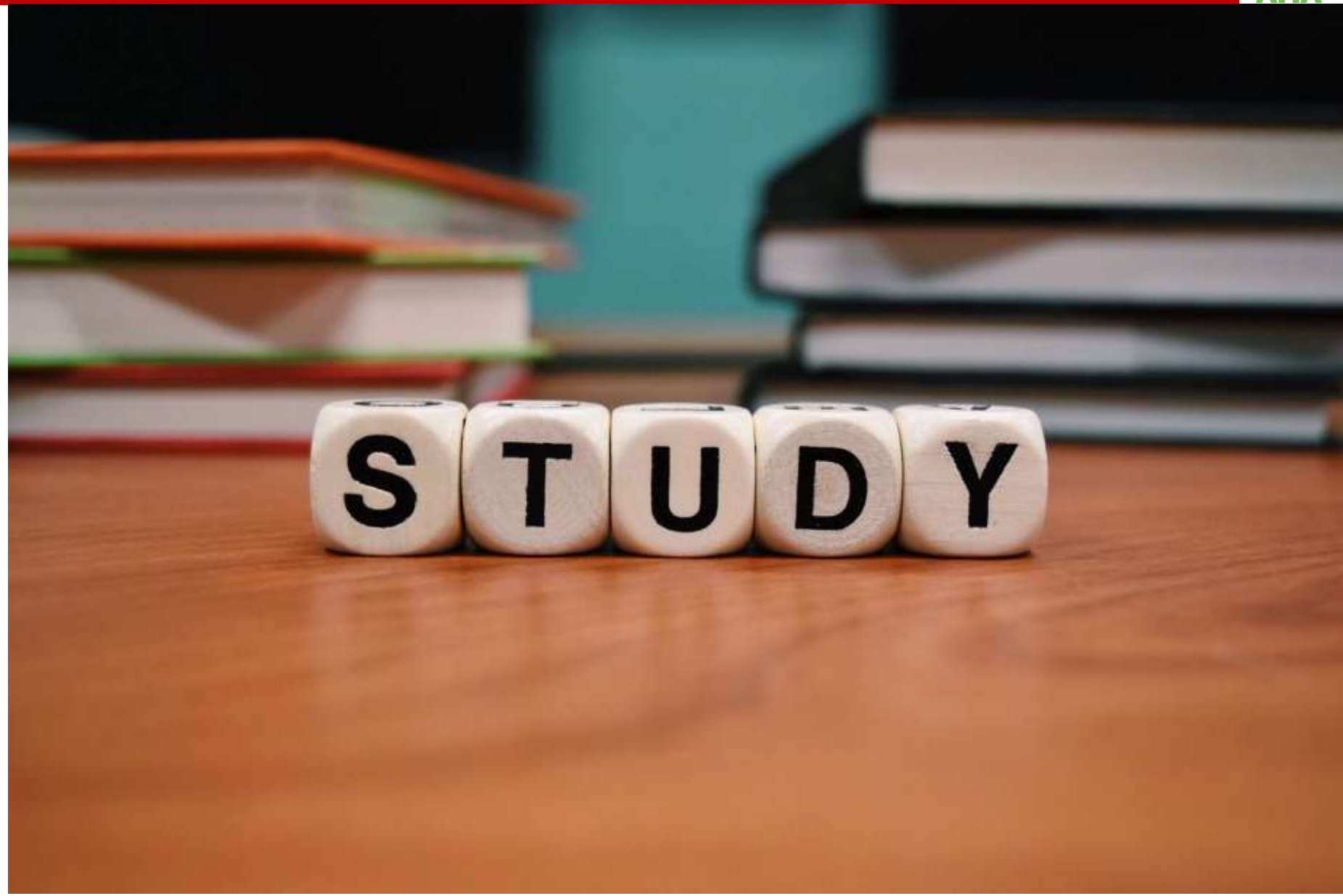
Clients across the value chain

Activities & Services

SECTOR	ACTIVITY / SERVICE
Development Corporation	Digital Solution for Corporates
Government/ Public Sector	Solar Project Management
Solar EPC Company/ PV Installer	Solar PV Design Software
Professionals/ Consultants	Digital Marketplace
End Consumer	Third Party Inspection
	Market Research
	Advisory (Policy & Regulation)
	Data Analysis & Reports

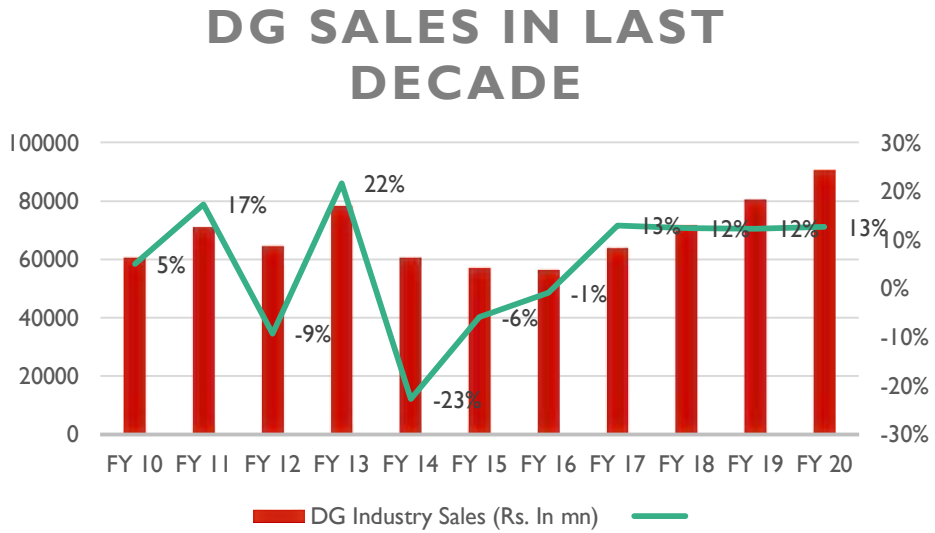
About the Study

- Identify the Potential of DG & PV Market in India
- Segregate the Potential User Segments
- Develop Suitable Business Models
- Develop a DG – PV Calculator for non-technical users



Background & Purpose of the Study

- Grid instability & power Deficiency in many states
- In 2020. an estimated of growth of 10 % sales volume of DG Sets
- Increase in DG set is a clear indication of increase in the back-up demand
- It opens up the market opportunity to integrate DG with Solar PV and Battery Energy Storage System (BESS) for better LCOE.
- Estimated increase of BESS market by 60% globally



Source: MOSL, Industry

Conventional & Current Mode

Why

Grid Instability

Power Deficiency

How

DG Power for Back-up

Output

Electricity for day-2-day work

BESS: Battery Energy Storage System

Background & Purpose of the Study

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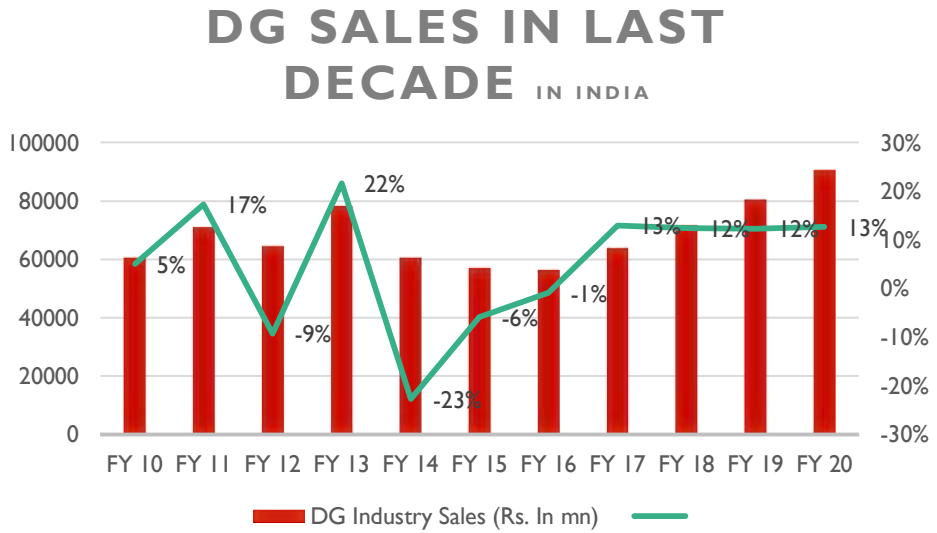


Source: MOSL, Industry

Smart Mode

Why — Grid Instability | Power Deficiency

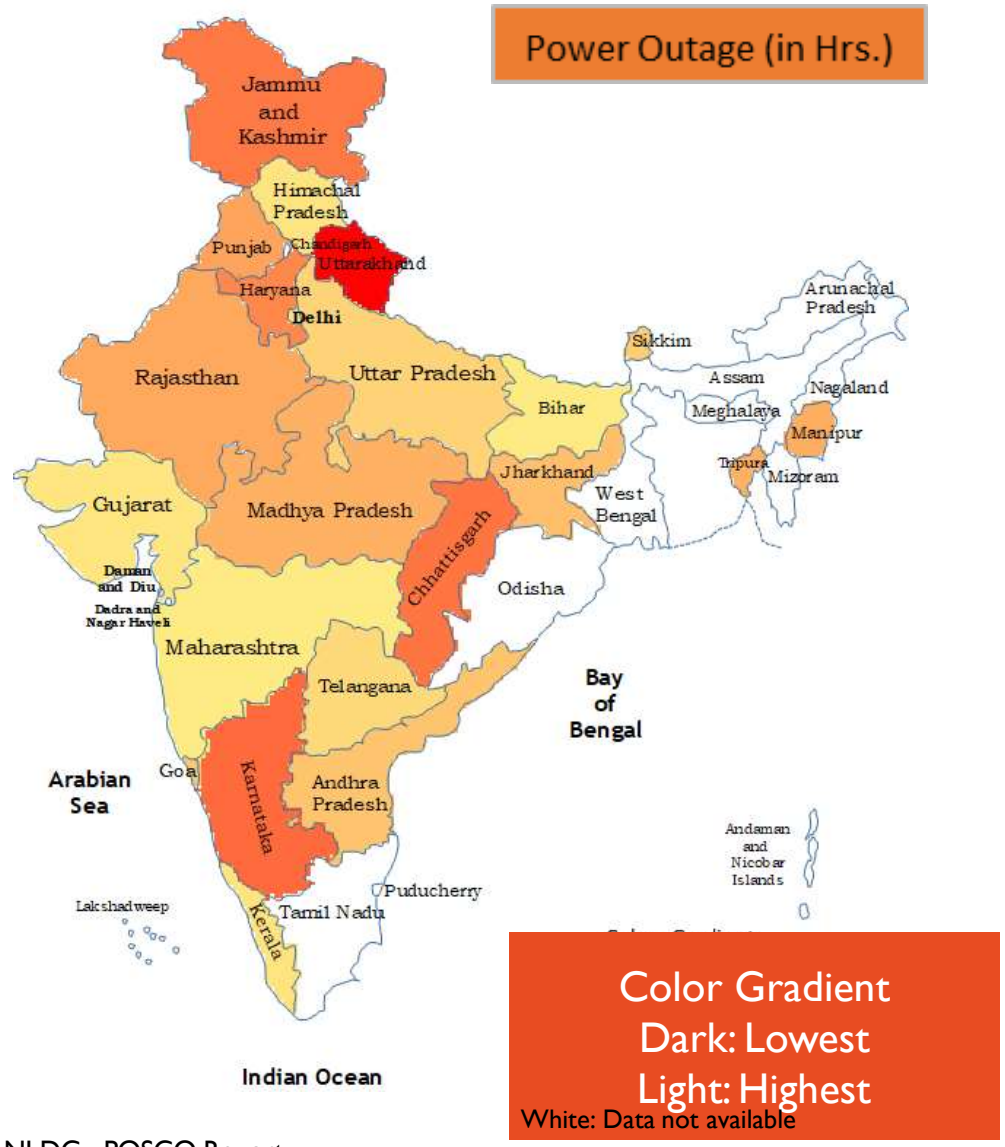
How

PV or PV+BESS

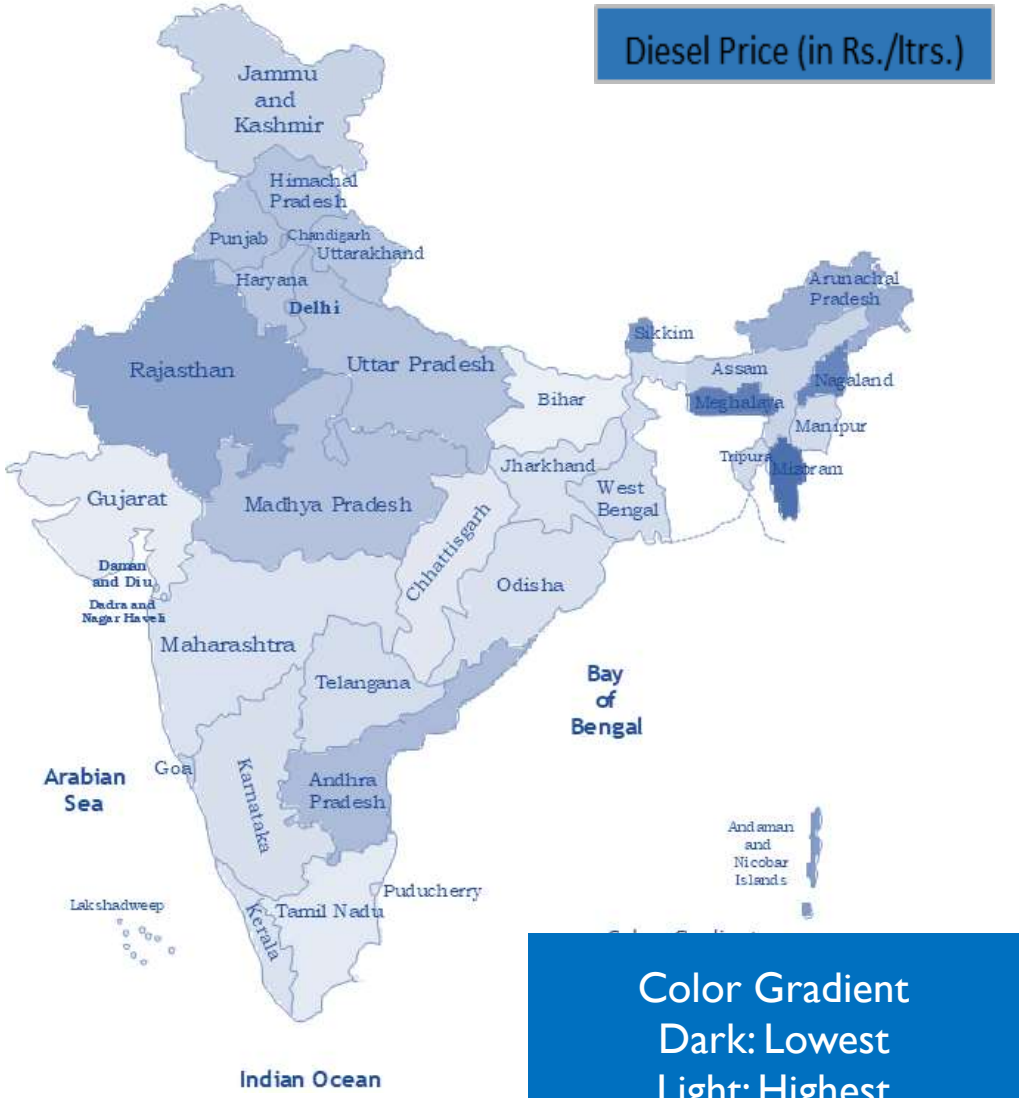
output — Electricity for day-2-day work

BESS: Battery Energy Storage System

State wise Comparison of Power Outage against Diesel Price



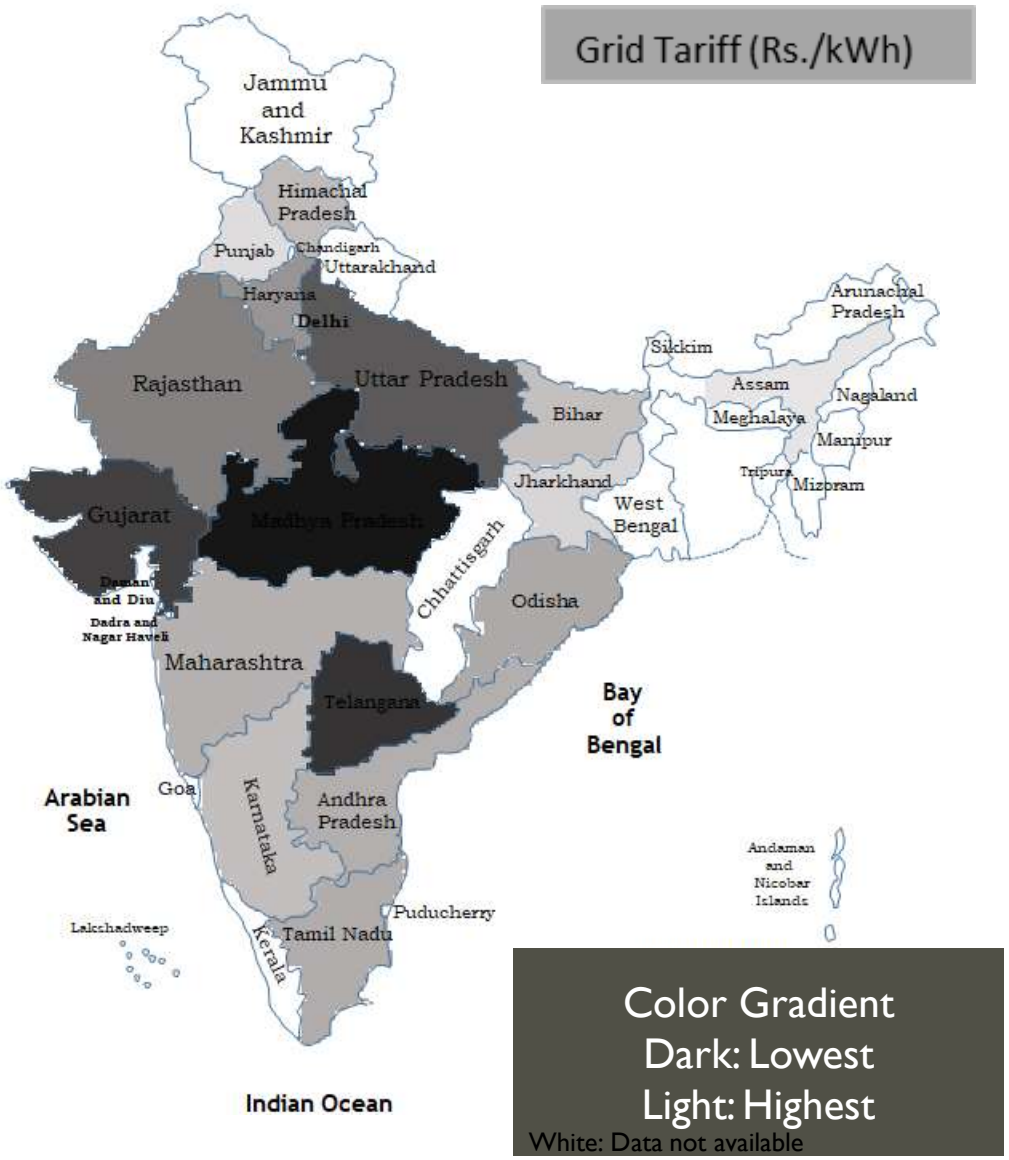
Color Gradient
Dark: Lowest
Light: Highest
White: Data not available

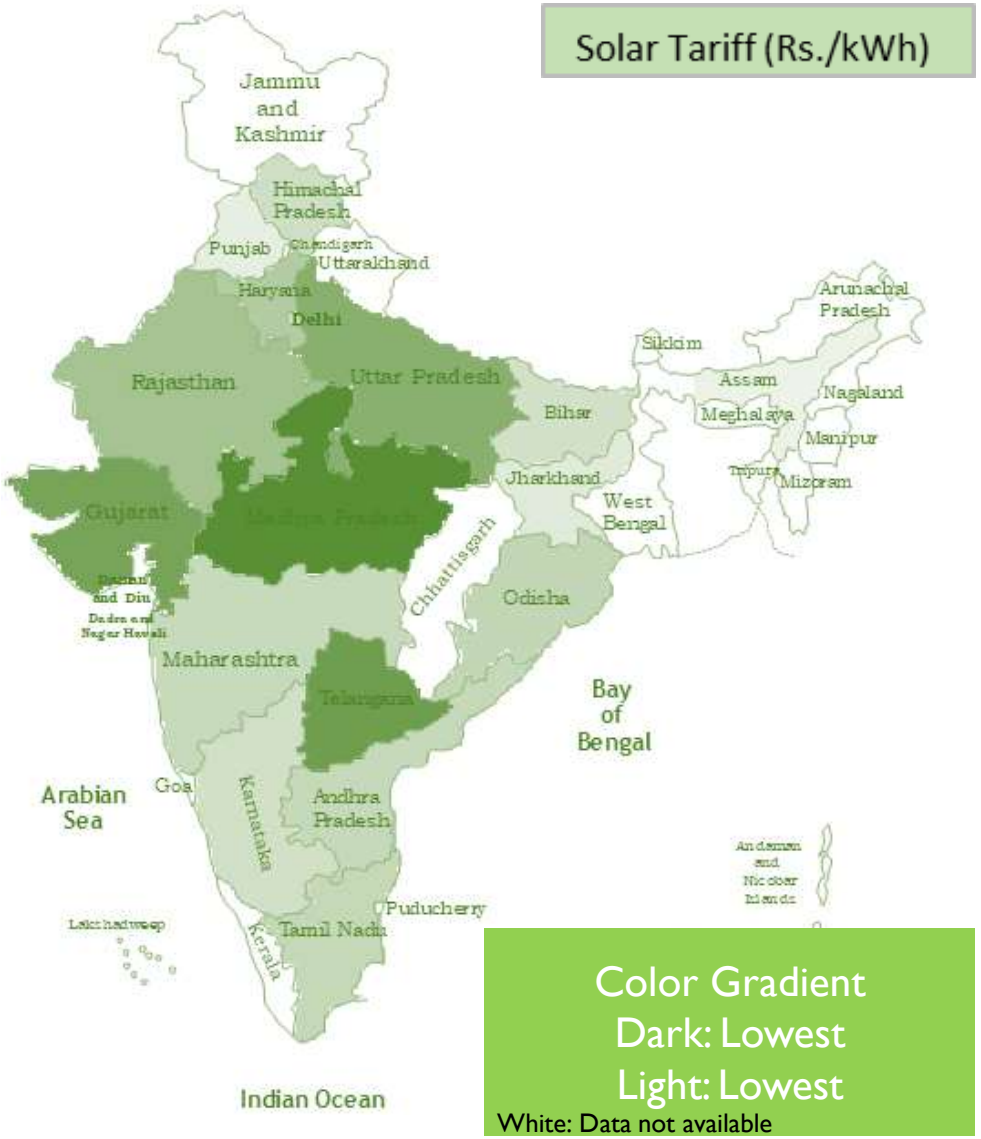


Color Gradient
Dark: Lowest
Light: Highest
White: Data not available

Source: NLDC _POSCO Report

State wise Comparison of Grid Tariff & Solar Tariff

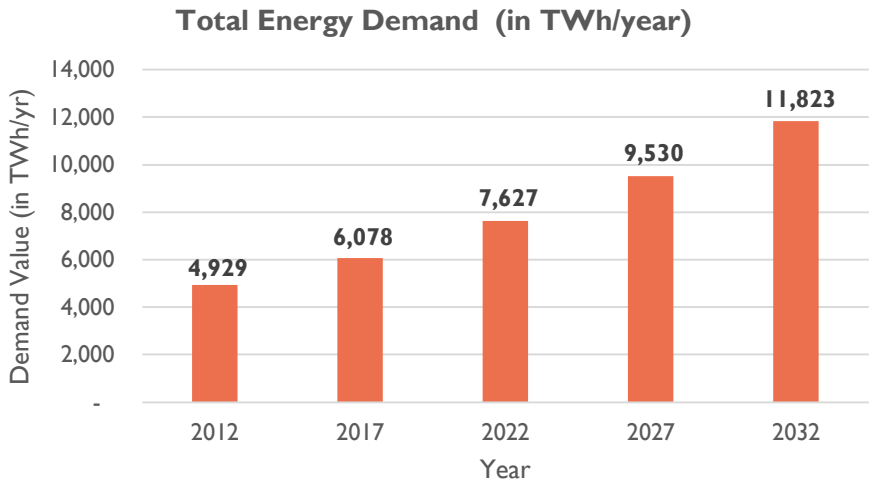


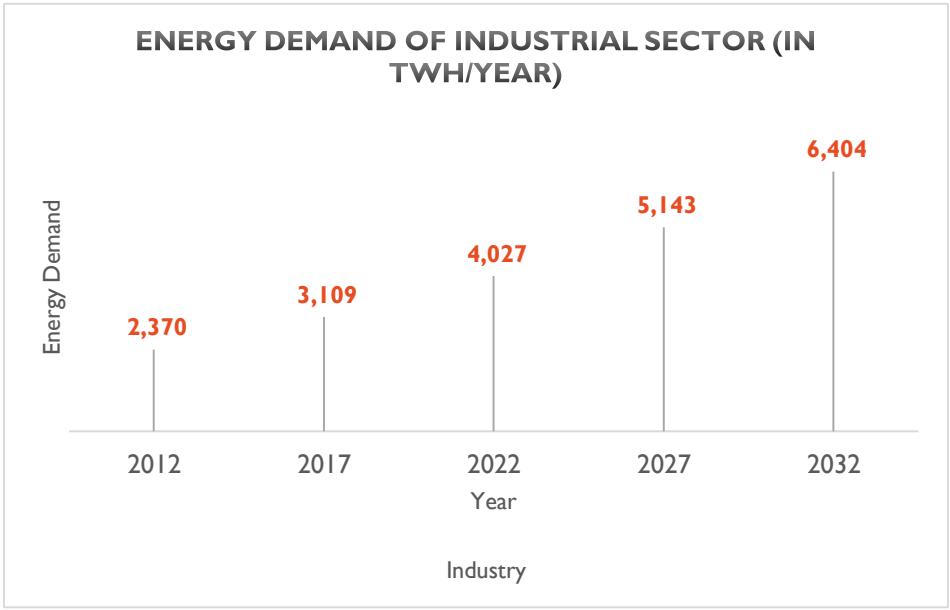


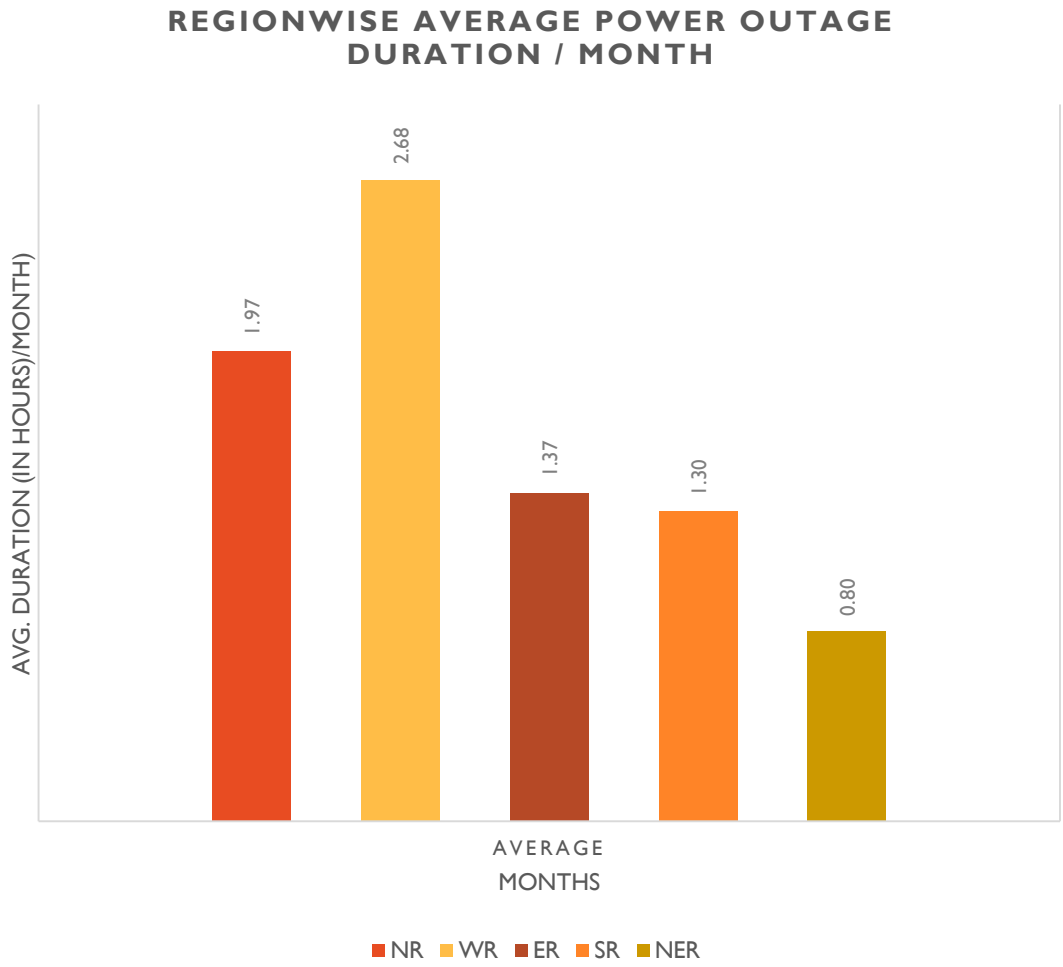
Source: NLDC _POSCO Report

Note: Some of the details are for utility scale projects so the landed tariff will be a bit higher

Demand and Power Outages







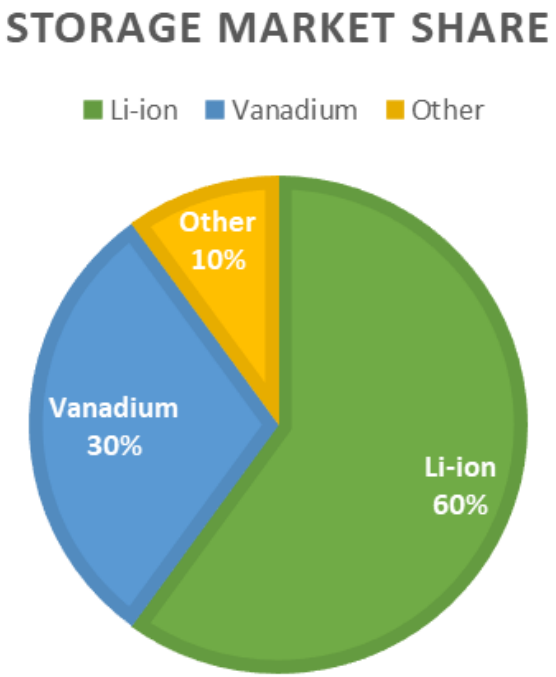
Market Analysis of DG

- As per CERC, DG sets installed across India had a cumulative capacity of 90,000 MW and has been growing at a rate of 5,000 MW to 8,000 MW every year.
- Energy demand will be more than 11,000 TWh/yr by 2032.
- To cater the energy demand the estimated supply of energy will be more than 16000 TWh/yr by 2032
- Major demand will be in the industrial sector which will require 6404 TWh
- Oil will cater to 28% of the Energy Supply which will be around 5000 TWh / year
- DG usage volume will grow exponentially as a part of the value chain in the Oil and Gas industry
- Average generation loss in one year across the country was 122,982 MU due to grid failure

Market Research Summary

Sample States/UT	Grid Outage	Diesel Price	Grid Tariff	Solar Tariff	Potential of DG Replacement with PV
Gujarat	Low	High	Moderate	Low	**Low** as Grid outage is low and Solar tariff is also low. **Potential: PV System**
Delhi	Moderate	High	High	Moderate	**High** as Grid Tariff & Diesel Price both are high **Potential: PV System + Small Storage**
Jharkhand	High	High	Low	Moderate	**High** as Grid Outage & Diesel Price are high **Potential: PV System + High Storage**
J&K	High	High	Low	Moderate	**High** as Grid Outage & Diesel Price are high **Potential: PV System + High Storage**

Market Analysis of Storage

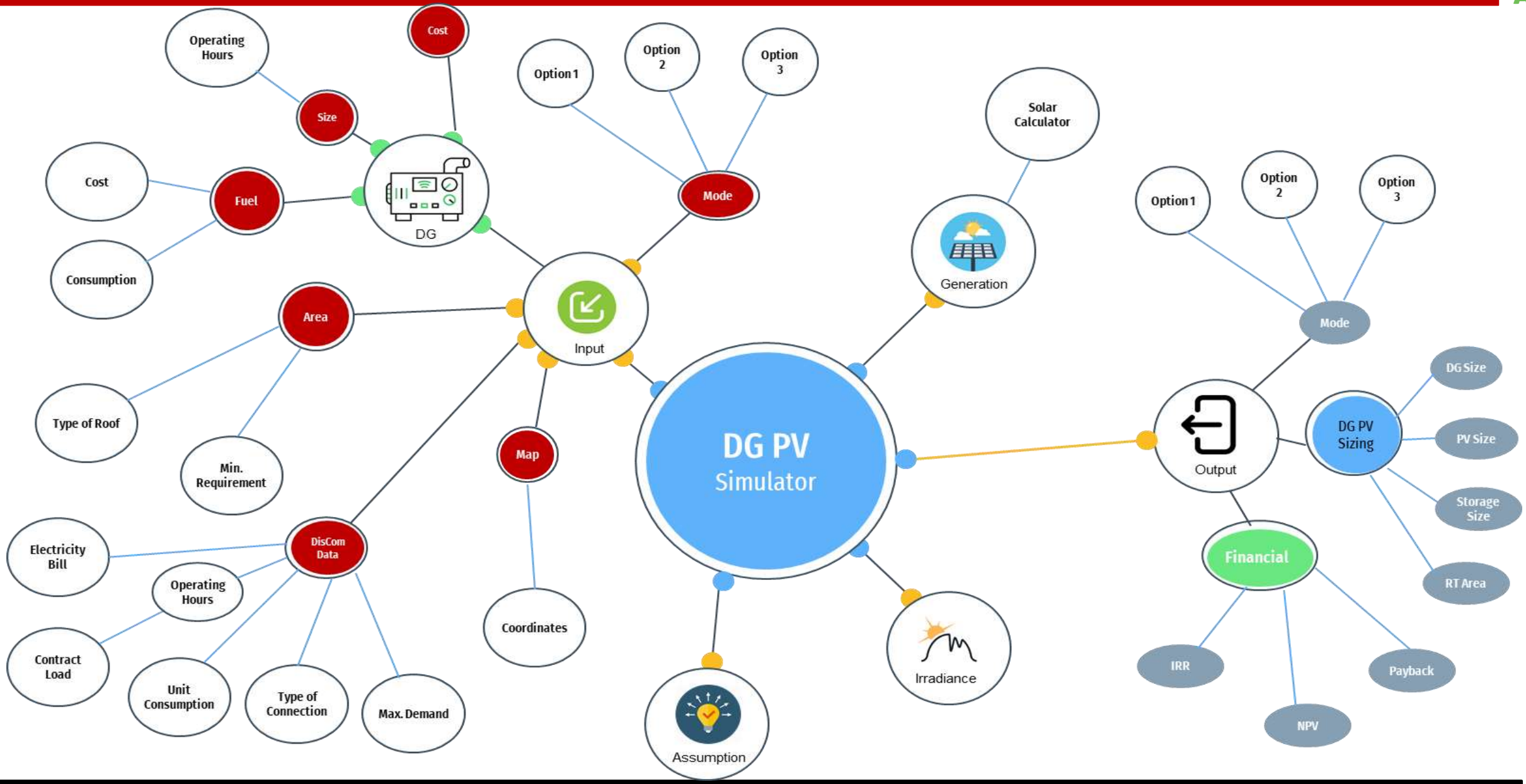


- Storage market is estimated to be $100 billion in next 10 years (Globally)
- Li-ion technology is expected to capture 60% of the market with a CAGR of approx. 23-25%
- Next most promising technology is Vanadium Redox Technology which is expected capture 30% of the market with a CAGR of approx. 15-20%
- Earlier analysis shows that a potential of 122,292 MU generation loss is to be catered through DG
- This amount of generation can only be sustained through systematic linking of DG with Solar PV and Battery Energy Storage System (BESS)

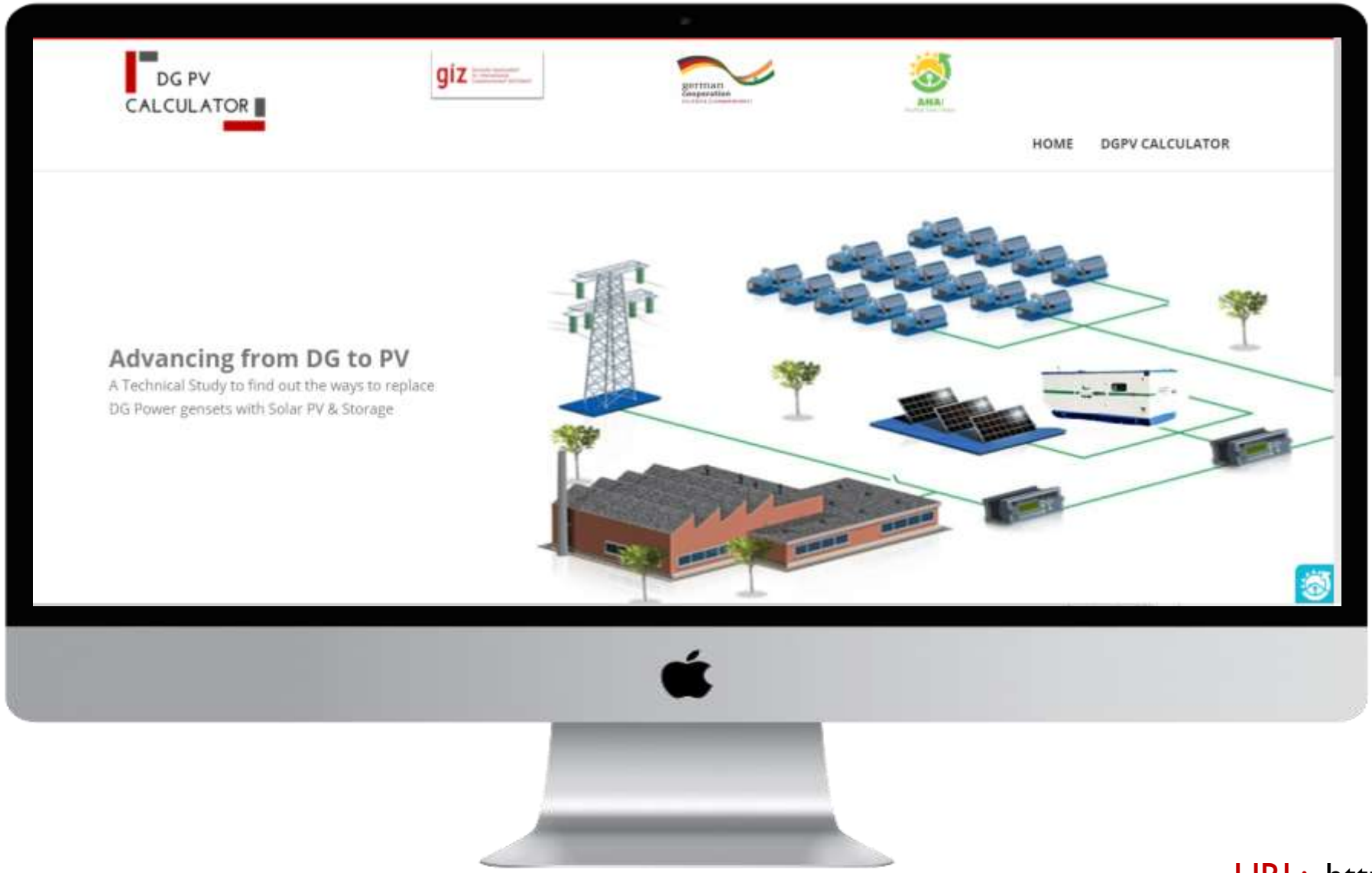
Business Models

- BM 1: Replacing DG with Solar PV and storage
  - High Potential for places working completely on DG like mobile towers
- BM 2: DG integrated with Solar PV
  - High Potential for places where Grid Outages are low
- BM 3: DG integrated with Solar PV and Storage
  - High Potential for Places where Grid outages is frequent but of small durations like cities and town

Mind Map for DG PV Calculator



Report Outcome – DGPV Calculator Tool



URL: https://dgpv.ahasolar.in

Key Features of the Tool

- The DGPV calculator is easy to use calculation tool for end users
- The rooftop solar capacity is directly calculated from electricity bill details of user
- The solar rooftop capacity is directly calculated from the contract load of the bill and provides a detailed shadow analysis report of the actual feasible capacity

Input Page

DG PV CALCULATOR

HOME DGPV CALCULATOR

Landmark	Unnamed Road, Rabari Colony, Amr.	Select Category *	Residential
Area Type *	sq mt	Rooftop Area *	5000
Average Monthly Bill (in ₹) *	65000	Average Monthly Units Consumed (in kWh/month)*	10000
Diesel Hours of Usage (hrs)*	2	Battery-inverter Hours of Usage (hrs)*	2
Average Demand (kW)	350	Standby/Critical load (kW)	200
Maximum Demand (kW)*	450	Battery System Voltage (V)	110
Customer Name *	XYZ	Customer Mobile *	9512186769
Project Name *	Project X2	Connected Load	500

Business Model

Replacing the Diesel Genset With Rooftop Solar PV and Storage

(•) Full Load ( ) Critical Load

Get Result | BM 1 | BM 2 | BM 3 | Graphs

Activate Window

Assumption

The sizing of DG set, solar PV system, BESS and their financial modelling is based on actual consumption value, contract load and the roof space available for installing solar PV system. Average runtime for DG set is considered as 2 hours and Storage is 2 hours. The DG set is taken as 675 kW and based on the DG size the optimum Solar PV system size is 53 kW. Also, the business scenario is under Full Load running condition of the DG set.

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- Back-up Slides

Selecting Area for Solar PV on the Software

Calculate Shadow Free Area

- Mark Coordinates on Map
- Build the outline to mark work area
- Create Shadow Objects

Software will calculate the Shadow Free Area and estimate the Solar PV can be placed on the Roof

3D Image

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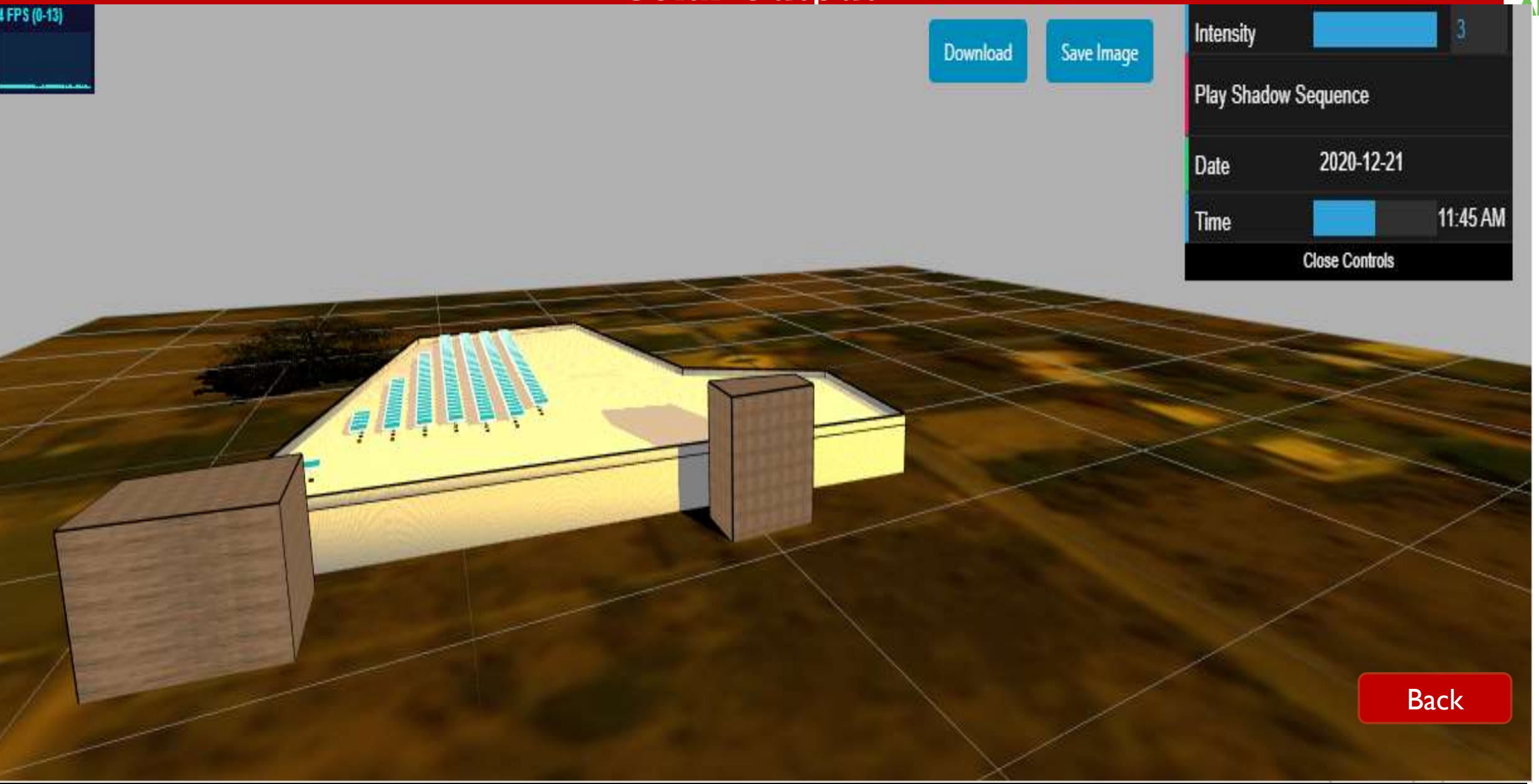
Solar Output



Solar Output

SUN ANALYZER OUTPUT

Model 1 – Replacing DG with RTPV and Storage

DG PV CALCULATOR

HOME DGPV CALCULATOR

DGPV Calculator

Back to DGPV Calculator | Download PDF

Replacing the Diesel Genset With Rooftop Solar PV and Storage
Full Load Sizing

Recommended BESS Capacity	1643	AH
Recommended PV Capacity	53	kW
Required Area of Rooftop for complete solarization	9806	Sq. Meter

Depreciation Type

Financial Recommendation For Straight Line Depreciation

Project IRR	15.7	%	Equity IRR	28.75	%
Project NPV	8.75	Rs. In Lacs	Equity NPV	11.79	Rs. In Lacs
Project Payback	6.46	Years	Equity Payback	3.74	Years
Estimated Project Cost	22.19	Rs. In lac	Estimated Project Cost without Subsidy	22.19	Rs. In Lacs
Average PV Generation	7498.42	kWh/hr			

Back

Activate W

Model 2 – Optimal Size of DG with RTPV

DG PV CALCULATOR

HOME DGPV CALCULATOR

DGPV Calculator

Back to DGPV Calculator | Download PDF

Optimal size of Diesel Genset With Solar Full Load Sizing		
Recommended DG Capacity	675	kW
Recommended PV Capacity	53	kW
Required Area of Rooftop for complete solarization	7088	Sq. Meter

Depreciation Type

Financial Recommendation For Straight Line Depreciation					
Project IRR	16.22	%	Equity IRR	29.91	%
Project NPV	27.36	Rs. In Lacs	Equity NPV	35.16	Rs. In Lacs
Project Payback	6.14	Years	Equity Payback	3.68	Years
Estimated Project Cost	61.7	Rs. In lac	Estimated Project Cost without Subsidy	61.7	Rs. In Lacs
Average PV Generation	7518	kWh/hr			

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Model 3 – Optimal Size of DG with RTPV and Storage

DG PV CALCULATOR

HOME DGPV CALCULATOR

DGPV Calculator

Back to DGPV Calculator | Download PDF

Optimal Size of Diesel Genset With Rooftop Solar PV and Storage
Full Load Sizing

Recommended DG Capacity	675	kW
Recommended BESS Capacity	5956	AH
Required Area of Rooftop for complete solarization	8100	Sq. Meter
Recommended PV Capacity	53	kW

Depreciation Type

Financial Recommendation For Straight Line Depreciation

Project IRR	14.36	%	Equity IRR	25.82	%
Project NPV	18.79	Rs. In Lacs	Equity NPV	29.47	Rs. In Lacs
Project Payback	6.95	Years	Equity Payback	4.26	Years
Estimated Project Cost	65.27	Rs. In lac	Estimated Project Cost without Subsidy	65.27	Rs. In Lacs
Average PV Generation	7517.58	kWh/hr			

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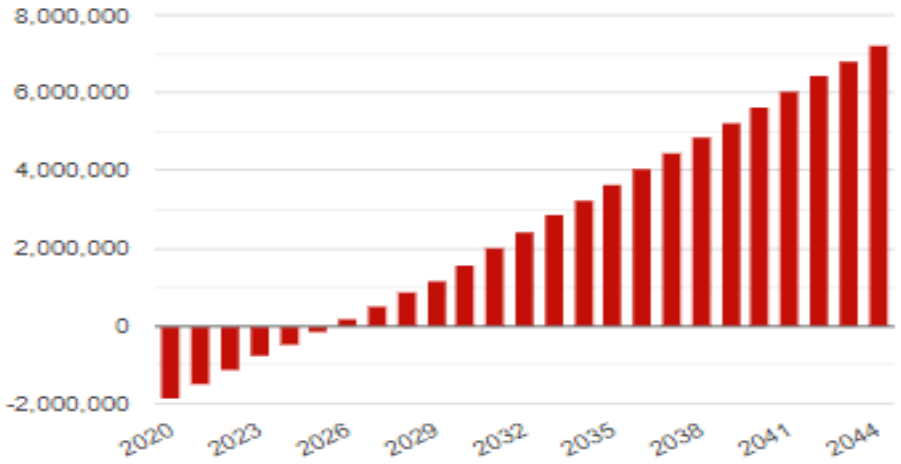
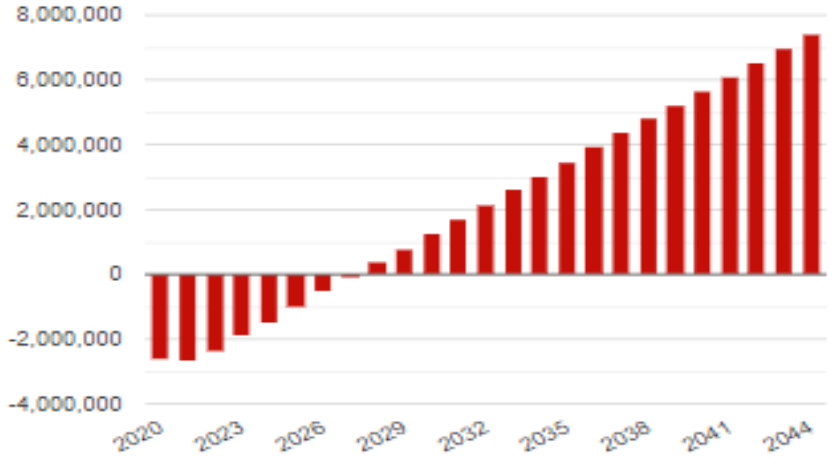
Graphs

HOME DGPV CALCULATOR

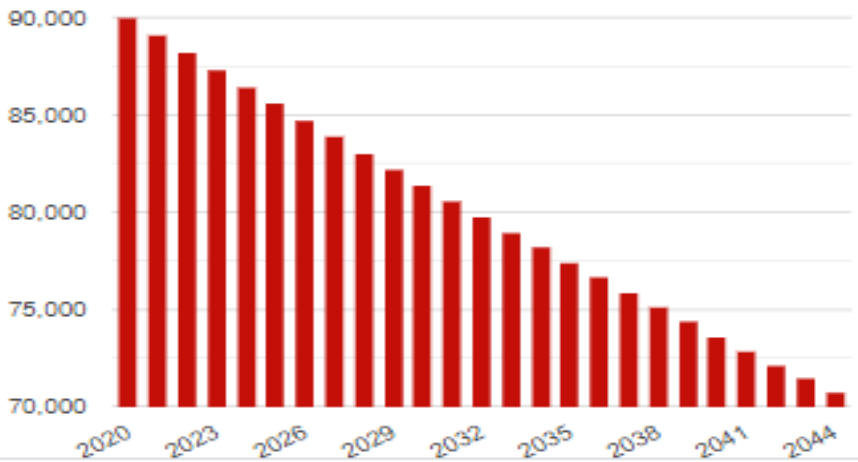
Payback Chart



Payback Chart AD



Year Energy Chart



Website Link

https://dgpv.ahasolar.in/users

Case Study – 1

- Type: Commercial, Delhi- NCR
- DG: 500 kVA
  - Nos. 2
- Summary findings of the DG set usage analysis:

Descriptions		Values
Total runtime of DG set in the year (in hours)	:	**290**
Average runtime in a day (in hours)	:	**1**
Total diesel consumption in a year (in ltrs.)	:	**14,075**
Frequency of Diesel supply in a year (in nos.)	:	**16**
Average diesel consumption in a day (in ltrs.)	:	**38.5**

Conclusion: High Potential User Segment for Integrating DG with Solar PV

Analysis: Back-up power requirement is high, Diesel Consumption is high, DG is available. So, Business Model 2: DG is integrated with PV to reduce fuel consumption and Cost

Case Study – II

- Type: Industrial, Delhi NCR
- DG: 1010 kVA
  - Nos. 2
- Summary findings of the DG set usage analysis:

Descriptions		Values
Average Grid outage (in hours / day)	:	**2**
Average Energy Consumption (in kWh / month)	:	**9,00,000**
Solar Installation Potential (in kW)	:	**600**
Average time lag of equipment during DG start (in mins.)		**3 – 5**

Conclusion: High Potential User Segment for Integrating DG with Solar PV and Storage

Analysis: Back-up power requirement is high, Diesel Consumption is high, DG is available. Critical machineries run on DG and hence cannot be replaced.

So, Business Model 3: DG is integrated with PV and Storage to reduce fuel consumption and Cost as well as uninterrupted power supply

Case Study – III

- Type: Commercial, Jharkhand
- DG: 250, 500 kVA
  - Nos. 2 (250 kVA), 1 (500 kVA)
- Summary findings of the DG set usage analysis:

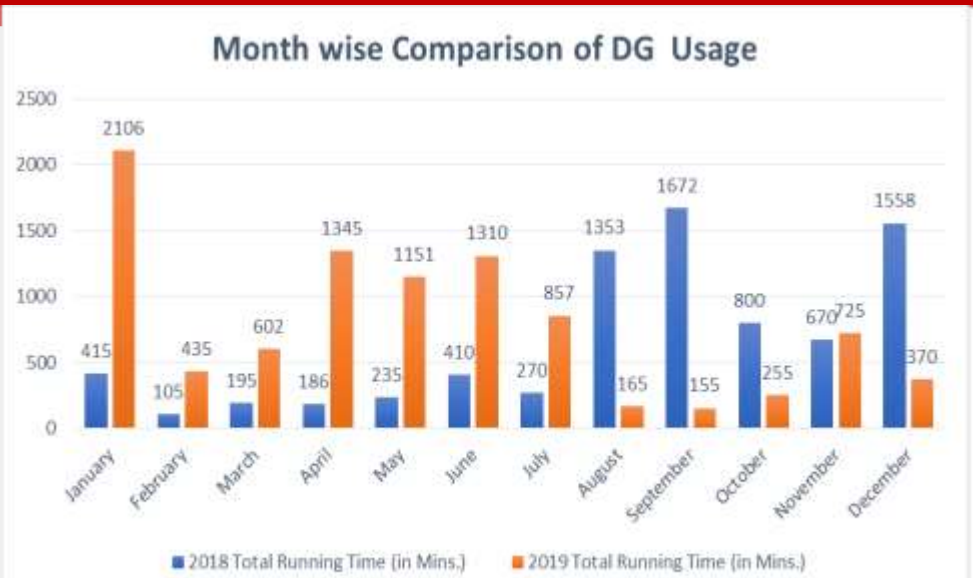
Descriptions	DG - 1 (250 KVA)	DG - 2 (500 KVA)	DG - 3 (250 KVA)
Total Generation (in kWh) in the investigated period of 30 days	303	3159	1
Average Generation (in kWh) per day	10.45	108.94	0.03
Maximum Generation (in kWh) per day	134.45	731.84	0.36
Total Runtime (in hours)	1.52	7.90	0.00
Average Runtime (in hours) per day	0.05	0.27	0.00

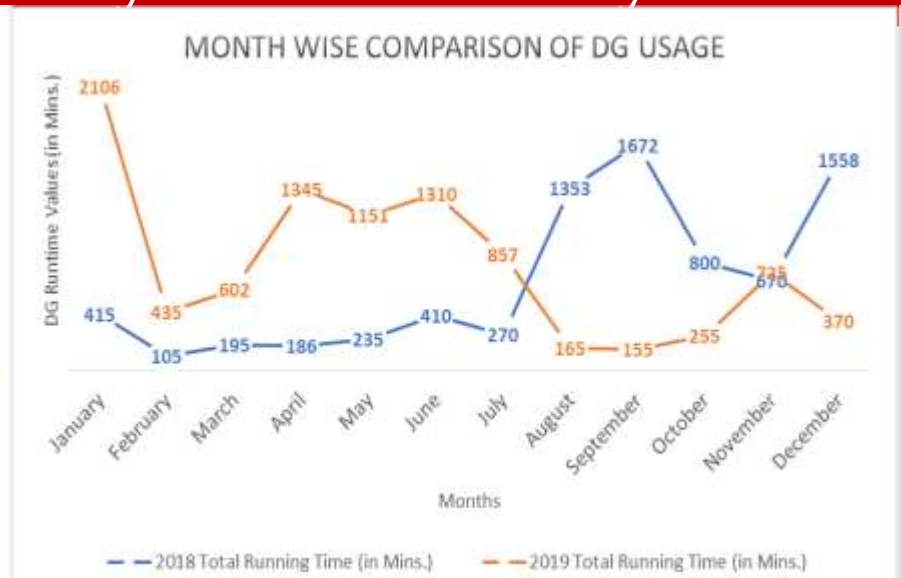
Conclusion: Medium Potential User Segment for Integrating DG with Solar PV

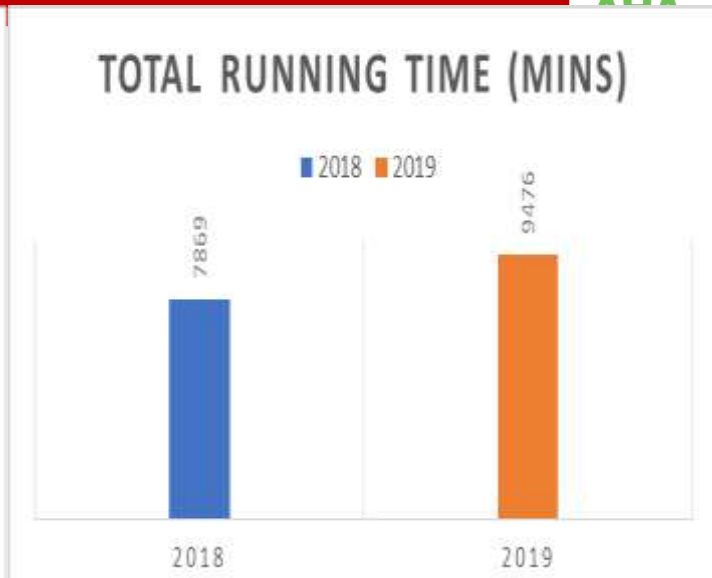
Analysis: Back-up power requirement is high, Diesel Consumption is high, DG is available. Critical loads require DG as backup and hence, cannot be replaced.

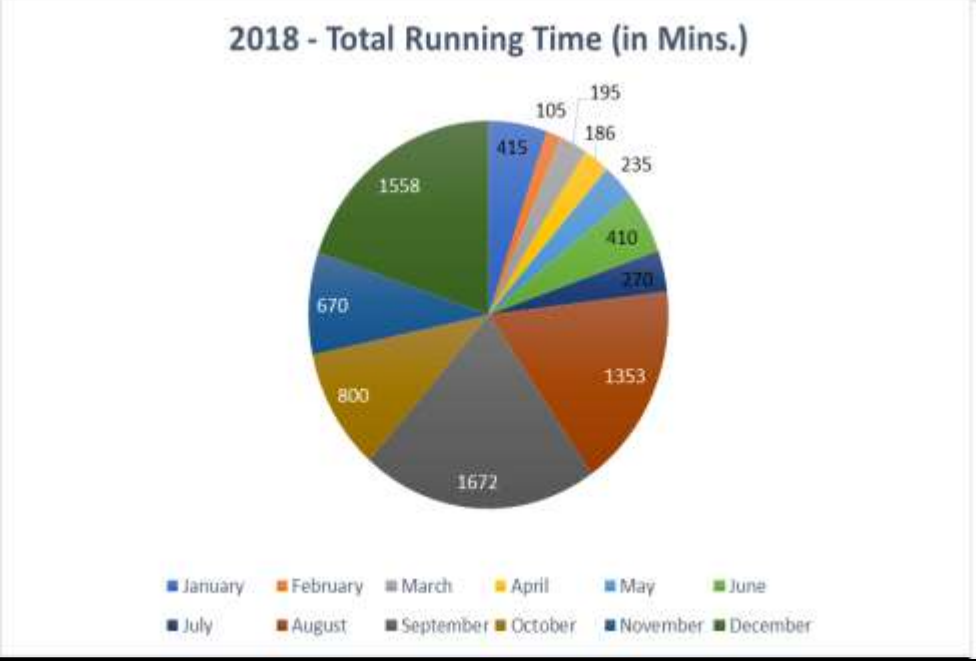
So, Business Model 3: DG is integrated with PV to reduce fuel consumption and Cost as well as uninterrupted power supply

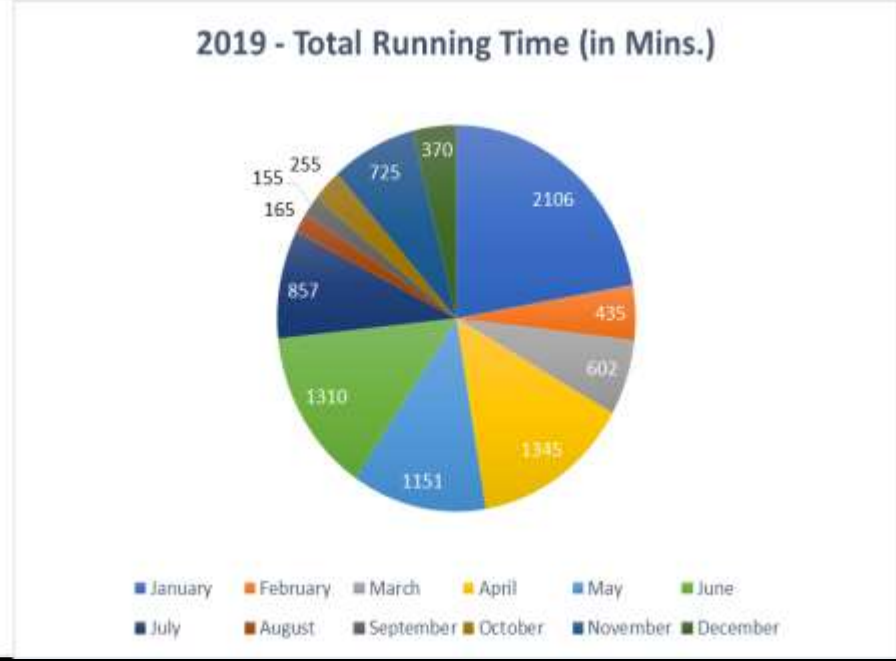
Data Analysis - Case Study I

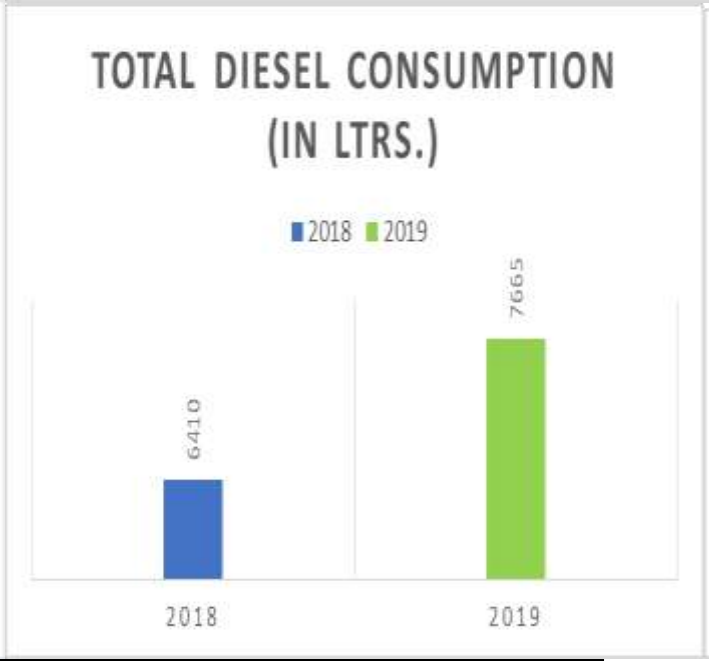












Data Analysis Graphs – Case Study III