

# KERALA STATE **ELECTRICITY** BOARD LTD

National conclave on  
Rooftop solar- Organized by MNRE

**16 & 17 -Dec 2023**



## Navigation-

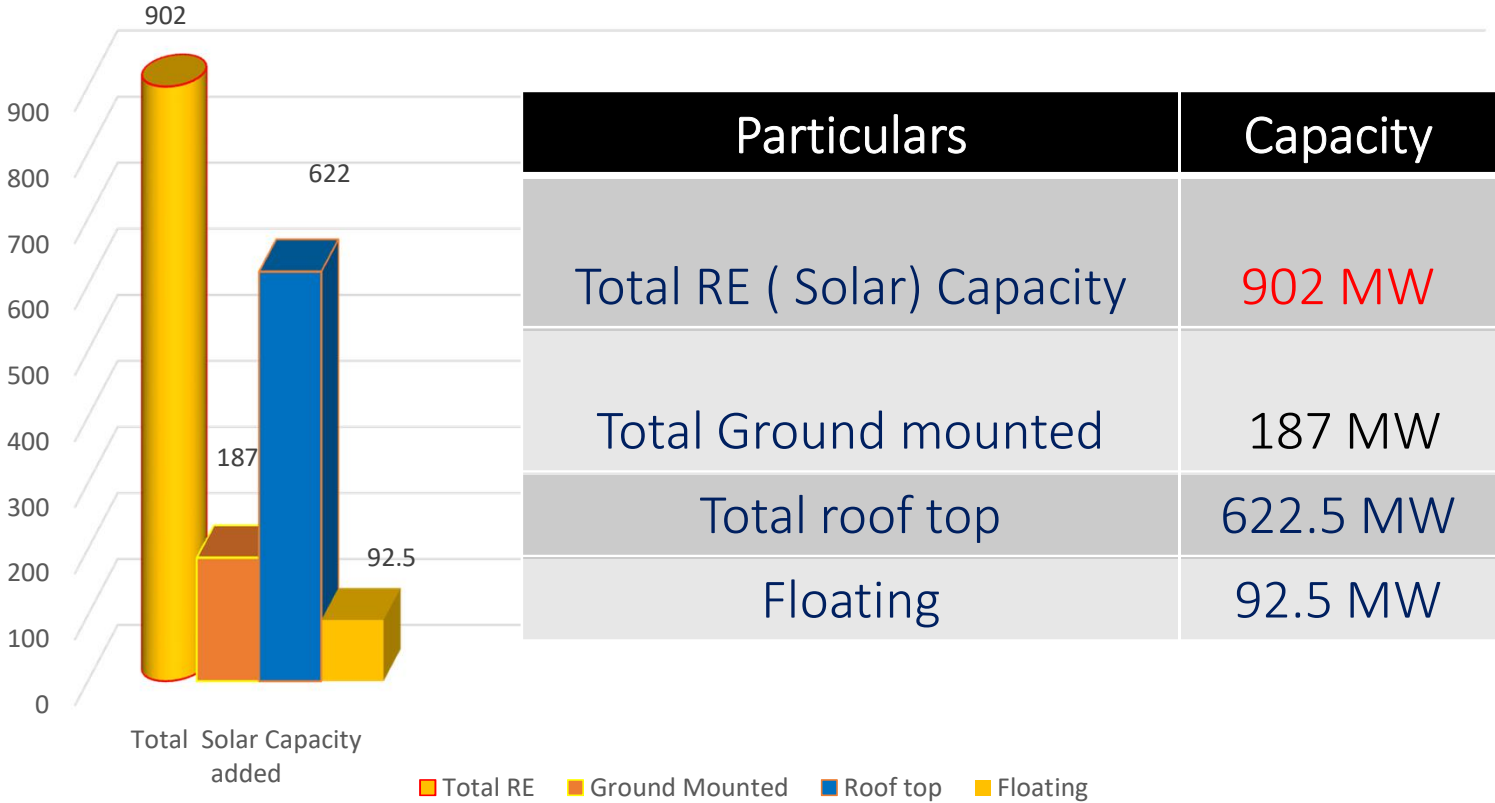
Achievement in Rooftop solar. ( First part)

Rooftop solar for all- Reaching economically disadvantaged sections. ( Second part)

Road Map and future planning in transition from Grey -Blue and finally to Green .( Third part)

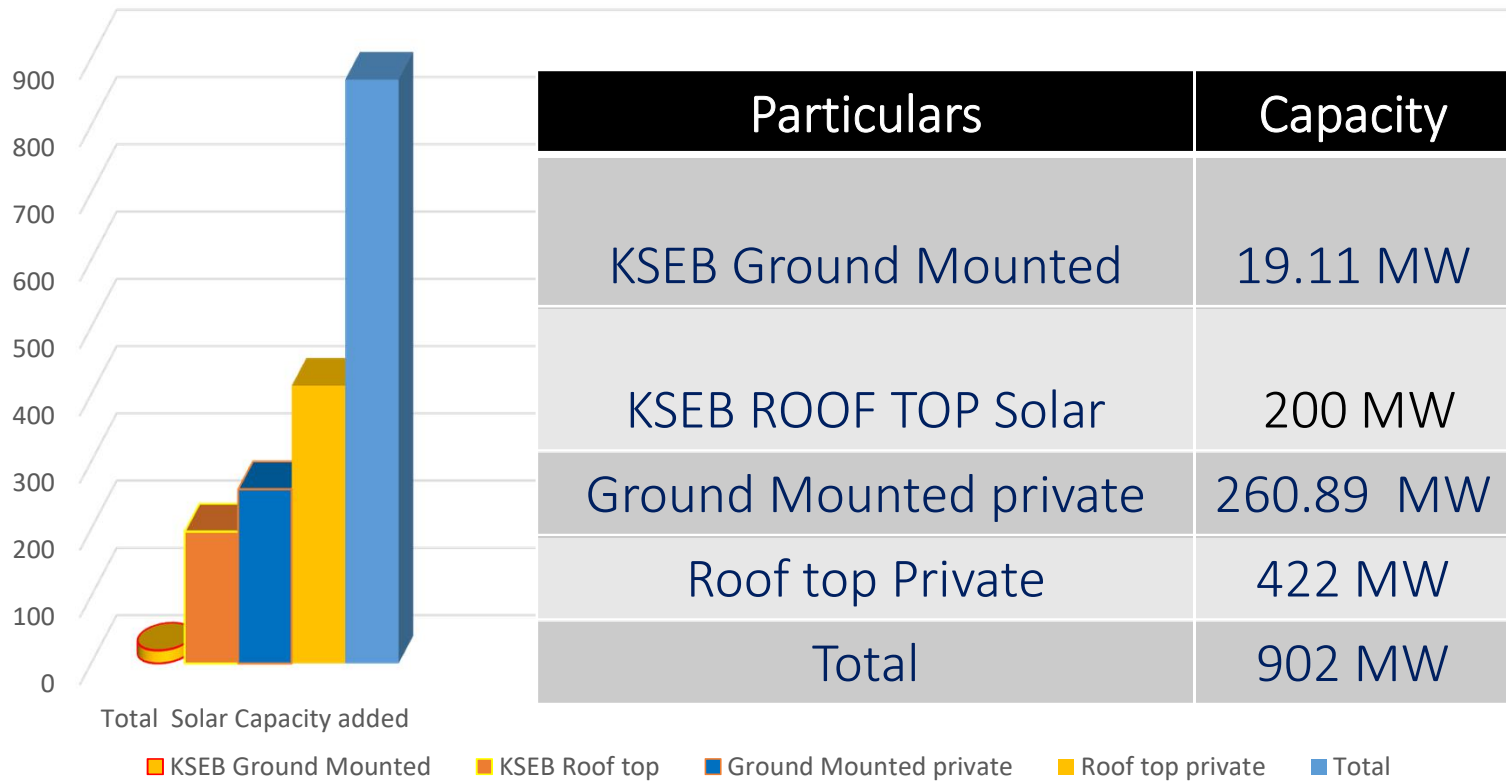
# Total RE Installation( Solar) in the State. RT & Ground split up)

Total solar Installation.



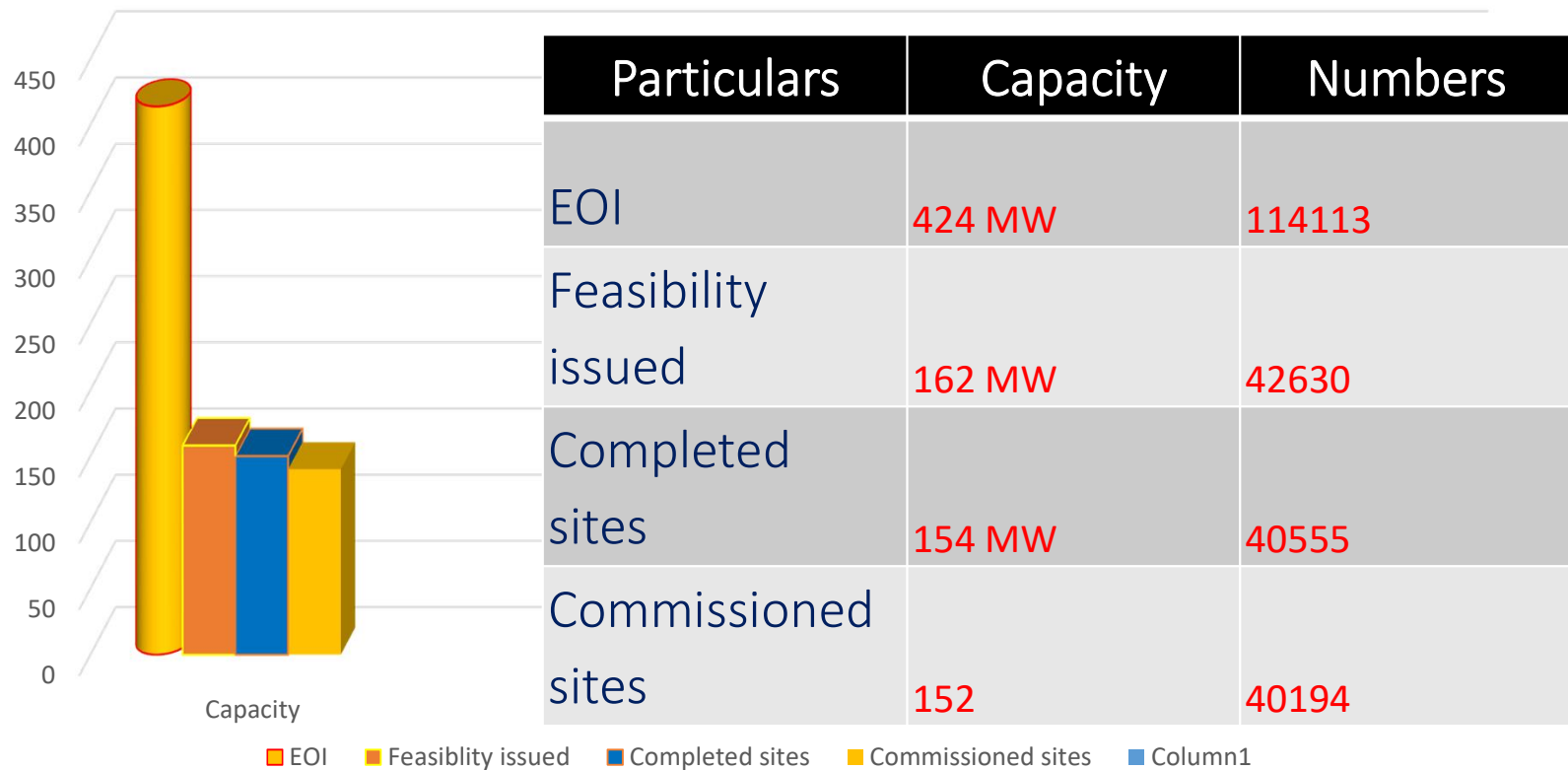
# Total Solar Installation .

Total solar Installation.

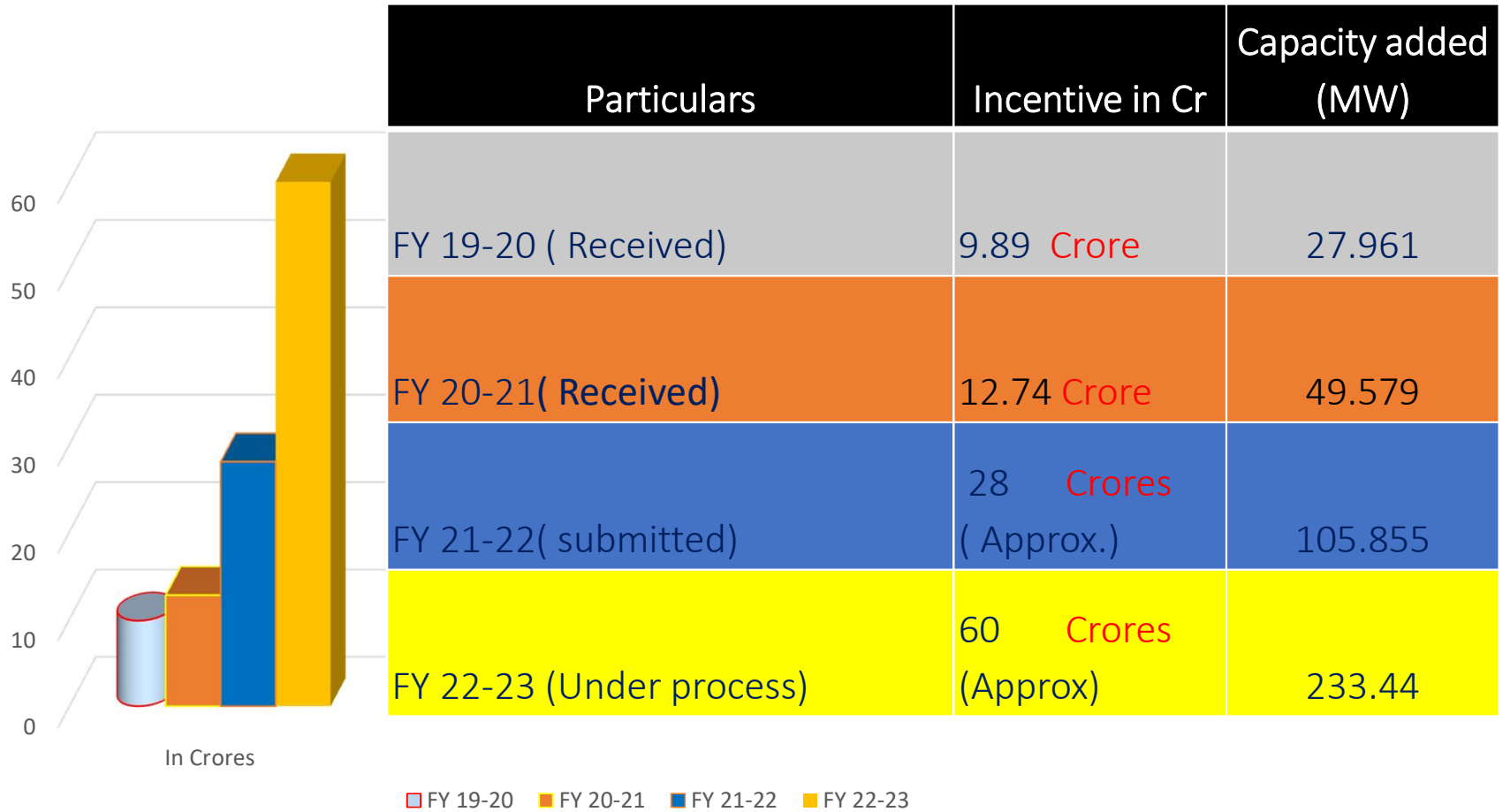


# Phase 2- MNRE-Soura subsidy update. Total allocated -200 MW (175 MW for KSEB & 25 MW for ANERT)

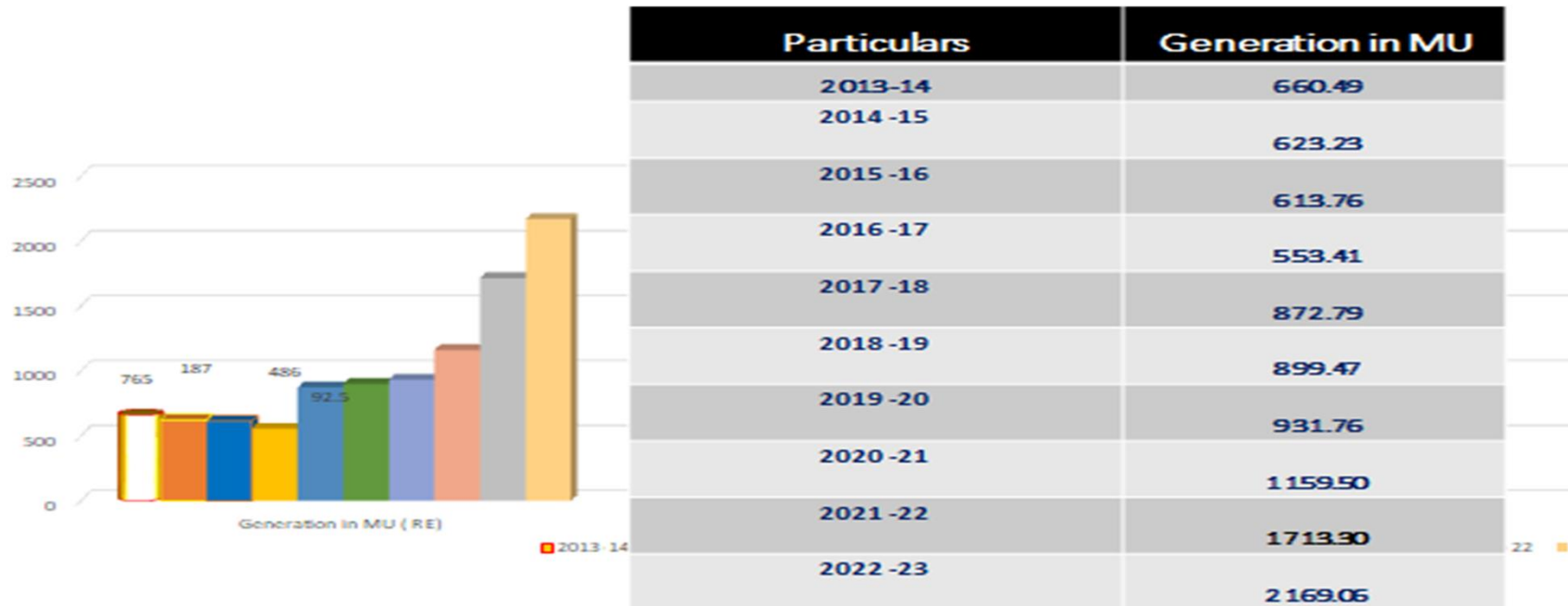
Total solar Installation.



# Incentive received from MNRE



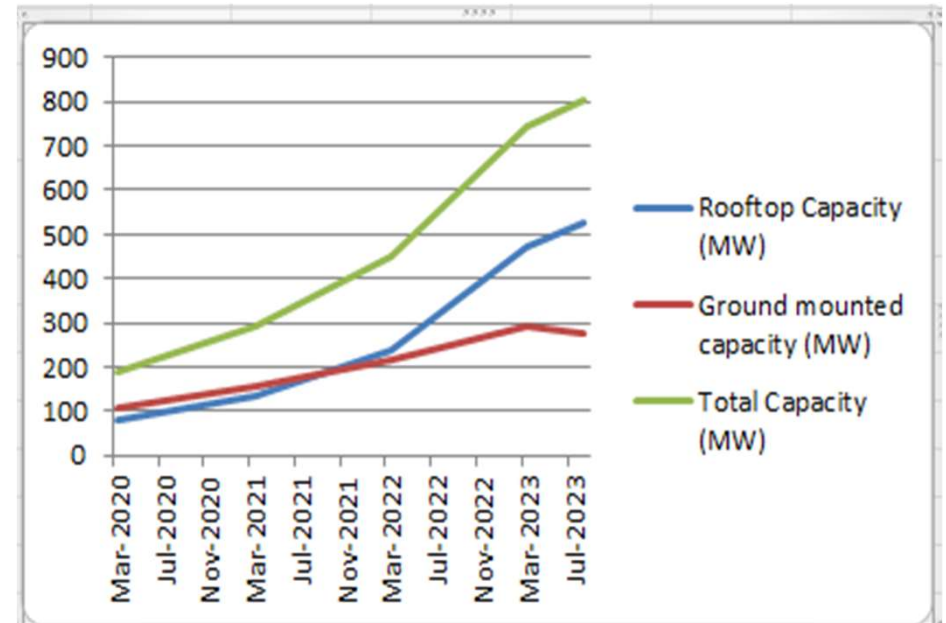
KSEBL has been taking all efforts to ensure renewable energy is promoted and put to use effectively to achieve the long-term goal set by the Government to become net neutral. Until the Year end 22-23, KSEBL added up **1148.35 MW** capacity in the entire RE scenario where as 742.85 **MW** capacity is from Solar plants. An exponential growth is noticed in the RE scenario in the last Year, Viz. 2022-23 . Different verticals identified for RE expansion for the Year 22-23 were Solar, Wind and Small Hydro projects. The Generation in MU during 22-23 for Solar Installation (KSEB) and Solar (IPP) was 856.63 MU and Wind (KSEB &IPP), Small Hydro (KSEB, CPP &IPP) put together was 1312.43MU, there by totaling to **2169.06MU.**



### **Solar Plants – Capacity addition:**

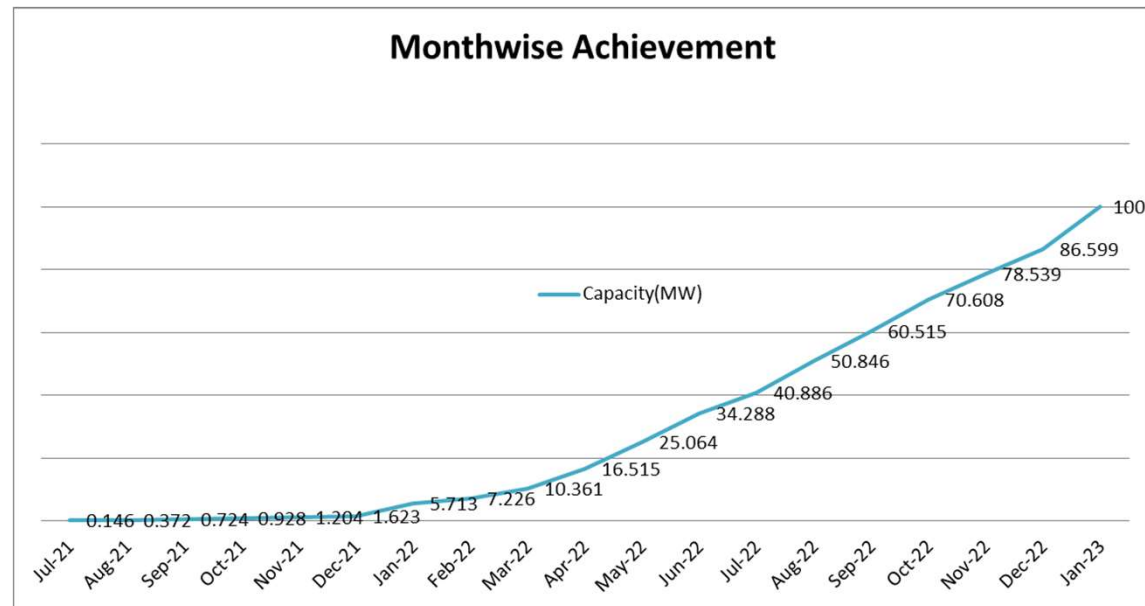
With reference to below graph , as per Power system statistics total capacity added until 2022-23 is 743 MW. Those added during 2020, 2021, 2022 and 2023 are respectively 188,293,451 & 743 MW. As of date progress of Roof top solar capacity figures up to 805 MW.

	<b>Rooftop Capacity (MW)</b>	<b>Ground mounted capacity (MW)</b>	<b>Total Capacity (MW)</b>
Mar-2020	82	106	188
Mar-2021	134	159	293
Mar-2022	237	214	451
Mar-2023	471	294	743
Aug-23	528	277	805





# Road Map to 100 MW- Exponential Growth



MNRE honored KSEB for its impressive progress on roof top installation of the state on 2022 also.

Chairman,KSEB,Pattom (cmdkseb@kseb.in) Add contact

8/31/2022 1:23 |

To: Director REES; State Nodal officer Soura;

Fw: MNRE || Showcasing the impressive progress of the State Kerala in

**Dear Sir,**

Pls refer the trailing e-mail, whereby it has been informed that this Ministry is organizing a National Workshop on Rooftop Solar (RTS) on 06.09.2022 from 10 am onwards at Atal Akshay Urja Bhawan, Lodhi Road New Delhi. This Workshop would be attended by all state implementing agencies of the rooftop solar program.

The State of Kerala has made an impressive progress in the installation of RTS plants under RTS Ph-II programme in the last few months. The Ministry would like to congratulate and thank you for this impressive progress. It has been decided that the progress of Kerala may be showcased to all the other implementing agencies for their guidance and motivation.

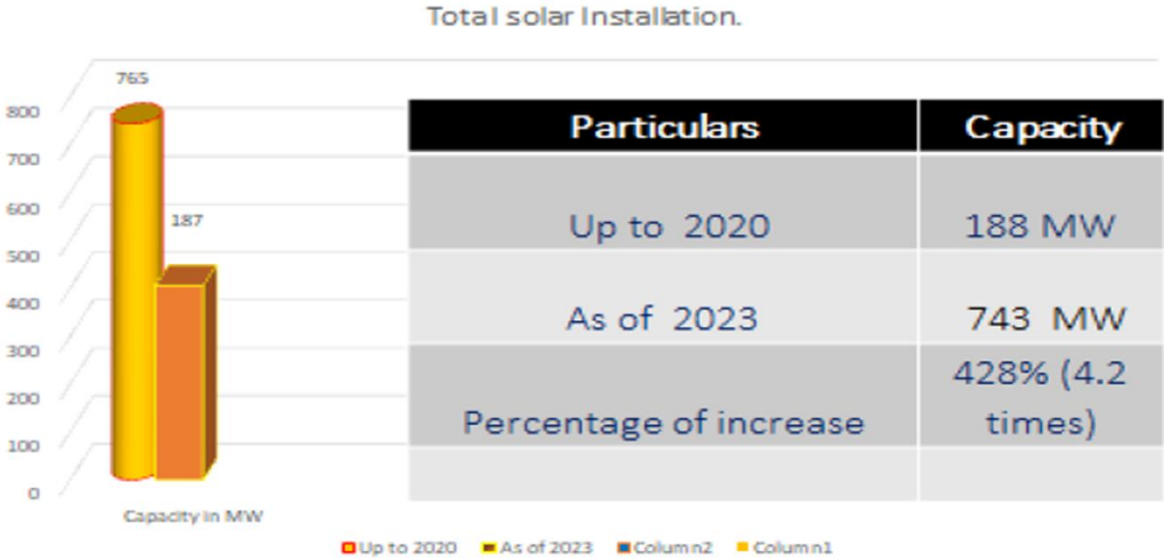
In this context, this Ministry would like to invite the KSEB official(s) to make a half hour presentation on the impressive growth made in RTS installations, highlighting the details which helped to make this possible.

It is requested to please send the confirmation and presentation for reference by 02.09.2022 via return e-mail.

**Warm Regards,**

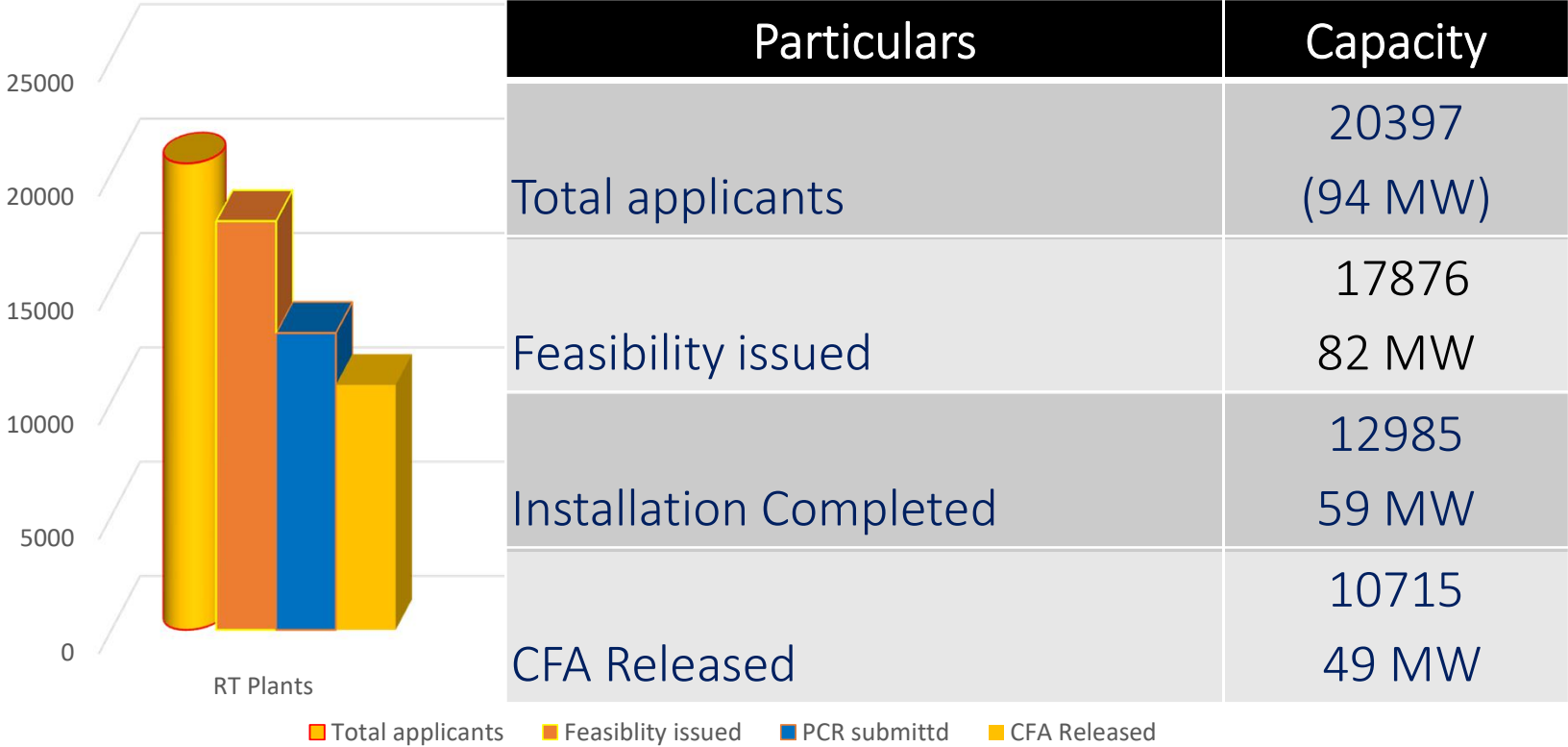
डा० वीपिन कुमार (आइ.ई.एस.)/Dr. Veepin Kumar (I.E.S.),  
उप निदेशक/Deputy Director,  
रूफटॉप सोलर डिवीजन/Rooftop Solar Division.

From the graphics it is worth to note that up to March 2020 the added capacity in solar installation was only 188 MW. But as of 2023 the capacity enhanced to 805MW, which is more than 4 times the achievement until 2020. Now the capacity is 902 MW.



# Simplified roof top Scheme of MNRE- Review

Total solar Installation.



A road map is proposed so as to complete 3000 MW capacity by 26-27. The potential of Kerala for solar, wind, SHP and Green Hydrogen are identified by MNRE are plotted. Achievement and target set for each year is tabulated.

RE Source	Potential (MW)	Achievement (MW)	Target (MW)					
			2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL
<b>Solar</b>	6,150	795						
<i>Rooftop (Domestic)</i>				150	150	125	80	<b>505</b>
<i>Rooftop (Government / Commercial)</i>				100	125	100	80	<b>405</b>
<i>Ground Mounted</i>				10	30	30	50	<b>120</b>
<i>Floating (With / Without BESS)</i>				100	110	80	100	<b>390</b>
<i>PM KUSUM</i>				35	35	35	5	<b>110</b>
<b>Solar Sub Total</b>								<b>1530</b>
<b>Wind</b>	1,700	72		35.5	37.5	100	118.5	<b>354</b>
<b>SHP</b>	650	210		35.6	39.5	54.5	39.4	<b>321</b>
<b>Others (GH)</b>	100			2	3	3	2	<b>10</b>
<b>TOTAL</b>	8,600	1124		<b>418.1</b>	<b>142.5</b>	<b>122.5</b>	<b>143.8</b>	<b>3010</b>

## **Kerala Power Policy 2019**

One of the key objectives identified in the draft State Power Policy is "*enhancing share of 'renewable energy in the Generation' Mix*". The major challenge in developing solar Power Generation in the State is identified as the lack of vast tracts of land required to establish large sized plants. Hence, decentralized solar panels on roof tops is identified as the desired mode for massive deployment of solar projects in Kerala.

## **About SOURA**

The Government of Kerala has launched the flagship project "SOURA " to add 1000 MWp Solar Power Plants to the network of KSEB Ltd, under Urja Kerala Mission in the true spirit of National Goal of achieving 100 GW of solar power by the year 2022. As part of the SOURA project, 500 MWp of Solar Power Plants are to be established by utilizing the Rooftop of domestic, public and private buildings including educational institutions, hospitals and commercial establishments.

The Project SOURA is designed as a DISCOM driven programme and is in line with the Phase II Grid connected Rooftop Solar (RTS) Programme notified by Government of India which envisages increased involvement of DISCOMs. DISCOMs will play a key role in expansion of RTS, as they are having a direct contact with the consumer. Roof Top Solar PV projects is identified as a means for increasing the internal generation and helps to meet RPO compliance from sources within the State. It also helps in managing day demands.

## **A. Government of Kerala and KSERC**

Kerala has launched '**Urja Kerala Mission**', an aggressive Energy Generation and Conservation programme, aimed at the integrated development of the electricity sector in the State. It aims at implementing **FIVE** important projects in the next 3 years, at a total investment of ₹ 15,000 Crore. The Urja Kerala Mission consists of projects viz Filament Free Kerala (Energy Conservation), E-safe (Safety), Dyuthi (Distribution), Trans-Grid (Transmission) apart from Soura.

The project was named **“SOURA RoofTop Pojects”** and when the project was introduced, the capacity of Solar Generation was only 102.76 MW. The project was envisaged in such a way that the Consumers could actively participate in the energy production, by utilizing their unused available area on roof tops and also to become economically sustainable in addition to energy sustainability to become **“Prosumers”**. With this project the consumers will actively participate in the progress of the nation.

### **Objective of SOURA & Organization Structure**

To strive ahead for achieving National goal and focusing on major development in power scenario that drive changes in

- (i) National Action Plan on Climate Change(NAPCC) which has a major bearing on production and consumption of electrical energy
- (ii) Falling price of renewable energy especially wind and solar
- (iii) Focus on decentralized generation of electricity
- (iv) Entry of Electric Motor vehicles
- (v) Technological innovations in energy storage

## 1. BUSINESS MODELS put forth to consumer ( Phase 1- Model 1,2 &3)

Three business models were formulated to suit the requirement of prosumers for whom solar plants were to be installed.

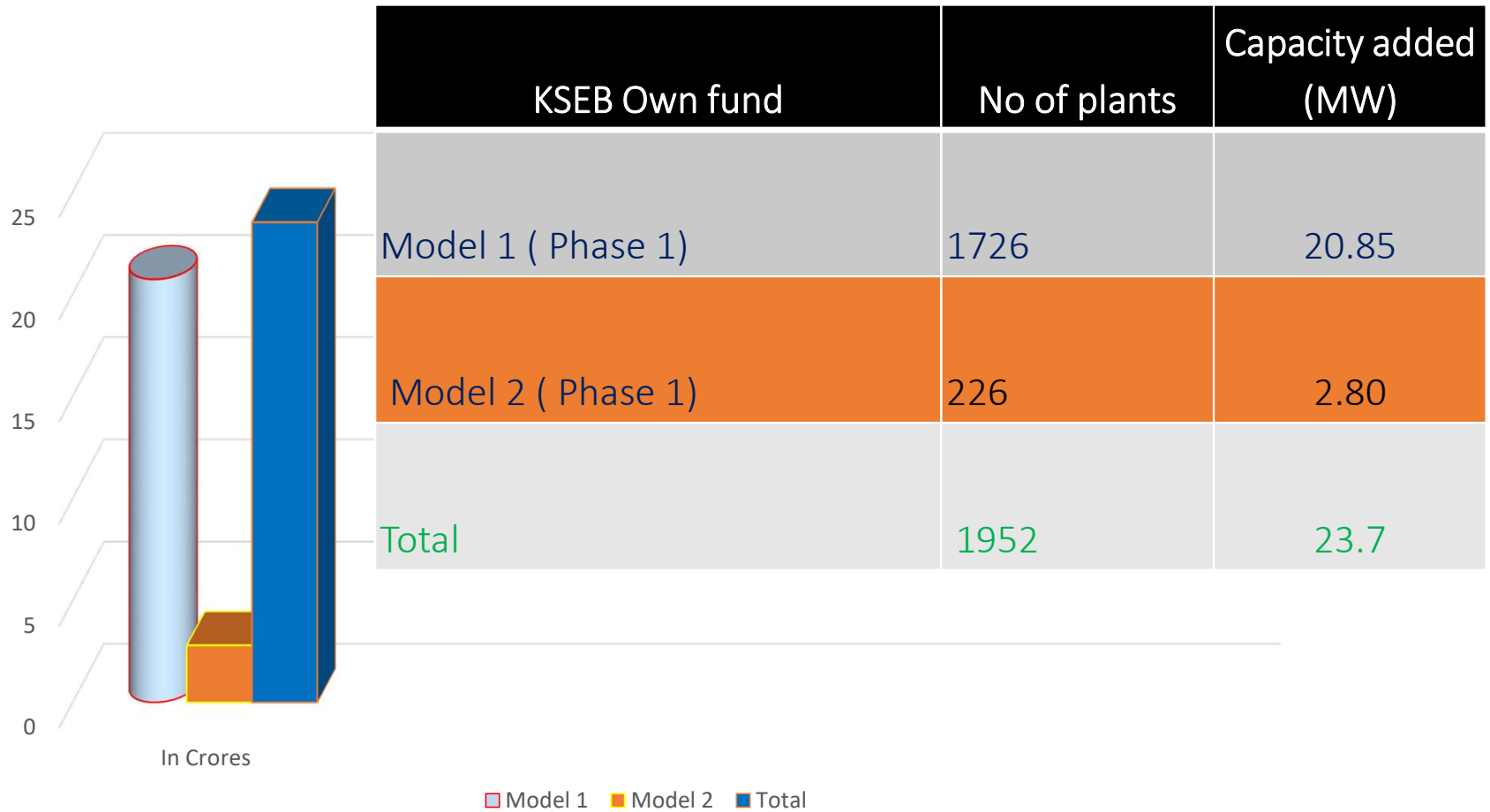
**Model-1:** Under this scheme, KSEBL will utilize the rooftop of consumers for installing solar plant and maintenance of the plant for 25 years, incurring full cost by KSEBL. The energy generated will be fed into the grid for a period of 25 years and a fixed percentage of generation (10 %) will be given to the consumer, free of cost for utilizing his / her/ their roof. Under this scheme 2038 plants with a capacity of 25 MW were completed and connected to the grid.

**Model-2:** KSEBL will install a rooftop plant at consumer premises and the energy generated will be sold to the consumer at fixed price for 25 years through PPA. KSEBL will install and maintain the plant for 25 years, incurring the entire cost of installation. Under this scheme 224 plants with a capacity of 2.80 MW were completed and connected to the grid.

**Model-3:** KSEBL will set up the solar plant after collecting the cost of the plant from the consumer. Excess energy, if any, after the consumption of the consumer (plant owner) will be settled at APPC (Average Power Purchase Cost) rate approved by KSERC at the end of settlement period.



# KSEB Own fund ( Phase 1 front runner project of KSEB before MNRE



# Second Business Model appreciated by World Bank

## Phase 2- Model I Kerala Model

Meanwhile MNRE introduced PHASE II GRID CONNECTED ROOFTOP SOLAR PROGRAMME and KSEBL shifted its focus to promote the scheme since the scheme is more beneficial for the domestic consumers being the major customer share of KSEBL.

In order to attract more consumers into the project , KSEB Ltd have devised another model named *KERALA MODEL* wherein the financial investment by the consumer for the plant apart from subsidy portion is shared by KSEBL itself so as to ease the burden of consumers and to bring low earning group as prosumers. The scheme has been approved by the Government of Kerala vide G.O.(Rt) No.5/2020/POWER dtd 13/01/2020. The consumer is eligible for proportionate energy generation from the plant based on their investment. This special model devised by KSEBL has been appreciated nationwide and by the World Bank.

### Advantage:

- 1. Requires only very low investment by consumers.
- 2. The energy share almost meets their present energy requirement. 25 years O & M of the plant by KSEB Ltd

		പ്രതിഭാഗം (₹)	കുടിശ്ശിക/സബ്സിഡി (%)	എനർജി പങ്കുവാങ്ങൽ (%)
1 ന്	2kWp, 3kWp	120 ലക്ഷം രൂപ	12%	25%
1 ന്	2kWp, 3kWp	160 ലക്ഷം രൂപ	20%	40%
1 ന്	2kWp, 3kWp	200 ലക്ഷം രൂപ	25%	50%

The E-Kiran portal has been developed by KSEBL through the MNRE Technical Assistance program. All grid connected solar plants application process and connectivity procedure will be managed through this single window system. All data transfer to MNRE SPIN portal for grant of Phase II subsidy programme and claiming of incentive for RTS capacity addition will be through the portal. Any solar developer implementing grid connected solar plants shall be registered in the portal.

#### Application Processing

- Tracking facility
- Integrated with KSEB customer relation management application (ORUMANET)
- Uploading documents to MNRE spin portal
- Event by event progress updation for consumers.
- Task by task process management for developers.

# Project Management through E- Kiran portal A Three tier full fledged Tracking Portal

**“വർഷാന്ത്യ സ്പെഷ്യൽ സൗര സബ്സിഡി സ്കീം”**

സൗര സബ്സിഡി പദ്ധതി

**പുരപ്പുറ സൗരോർജ്ജ നിലയം സ്ഥാപിക്കാൻ 40% വരെ സബ്സിഡി**



Rooftop solar for all- Reaching economically disadvantaged sections.

**Installation of Solar Power plants for financially and socially backward sections-Green Energy for BPL Consumers: KSEB Pilot project:**

As a pilot project KSEB implemented 2 kW plant in BPL house hold at Palghat in Kuzhalmannam at Nocholly Grama panchayath. This colony is famed by the well-constructed by Sri. Nocholly Balakrishnan and Mahatma Gandhi to circumvent the denial of water from public well to Harijans. The cost of plant was born by Palakkad District panchayath. The beneficiaries need not pay electricity charge for the next 25 Years and they will be getting an income as well for the excess power exported to the grid through net meter in the next 2.5 decades. The project is commissioned on June 2022.

**Model Project commissioned at Kuzhalmannam.**



### Advantages of above Model:

- Free electricity for 25 Years.
- Balance amount will be taken up by KSEB and 2.69 Rupees per unit will be given
- 1, 35 000 Rupees is the cost of plant. Subsidy amount 29,176 Rupees. Customer/ LSGD will pay 1, 05,824.
- 2 kW RTS plant in each household • Units generated/month  $(4*2*30) = 240$  units • Average Monthly consumption = 50 units • Excess unit generated = 190 units • Monthly income earned by the consumers  $(190*3.22) = \text{Rs } 611.88$ .

### Similar Projects in SC-ST Colonies:

Installed solar Power plants on SC-ST Colonies like Ellaikkadu, Ramarpannai, Muthu swamy, Pudur, Poovarathi, Marathikkadu, and Ramarpannai under Chittor Block panchayath. Total cost of the plant is Rs 40, 20,450/- (Rupees forty lakhs twenty thousand four hundred and fifty only).

As a case study Mamarathu kadu colony (Consumer No 1168091003947) under perumatty Grama panchayath is attached here down.

Consumer Number	Capacity of Plants (kW)	Average monthly consumption (units)	Present monthly Savings Energy charge (Rs)	Expected Monthly Income against solar generation (Rs)	Expected total monthly profit (Rs)	Current charge pay (Rs)
1168091003947	2kW	50	158	558.6	716.6	Nil



**Remote Village- Grid independent homes in Kerala-Green Power without Grid.**

To cater Power to hamlets where PowerGrid's are not available, battery managed solar plants are set up by KSEB. Many habitations like Alimooopan, 30-acre colony, Oruvampady, Katchithode, Kuriyarkutty, Sooriyappara etc. in Muthalamada and Nelliampathy Villages in Palakkad district

Colony	Alimooopan Colony	30 Acre	Oruvampady Colony	Katchithode	Kuriarkutty	Sooriyappara	Anamada
Capacity	14 kWp	14kWp	14 kWp	14 kWp	14 kWp	14 kWp	14 kWp
Battery	11Hrs	11Hrs	10Hrs	11Hrs	10Hrs	10Hrs	11Hrs



# Green Income Project

ANERT Initiative



# Introduction

- Green Income Project scheme to install subsidized grid-connected solar power plants at Domestic Sector implemented across Kerala.
- Green Income Project is a project started by Govt of Kerala under the leadership of ANERT with the aim of bringing the benefits of Subsidy Programme of MNRE project to the economically backward families.
- Here the solar power plants were installed at free of cost.
- The project is being implemented using 40% subsidy amount from the Central Government and the remaining amount from the development fund of the State Government.

# Solar power plants in Life Mission houses

- ❖ The project of installing solar power plants with a capacity of **2 kilowatts** for the selected Houses built under Life Mission Project of Govt of Kerala is progressing.
- ❖ The amount required for this project in addition to the subsidy is met from the plan allocation of the State Government.
- ❖ The list of houses constructed for the poor families of the general category, Scheduled Castes and Scheduled Tribes category and fishermen category has been considered.



Total project cost per house is **Rs.1,35,000/-**. Central financial Assistance of **Rs. 39,275/-** were spent by Central Government and remaining **Rs. 95,725/-** will be spend by State Government

**Under this project, 549 LIFE mission houses were solarized.**



# Solar Power Plants in Scheduled Tribe Colony, Nadupathi, Palakad

- Under the Green Income Project, ANERT had decided to install 2 kW Grid Connected Solar Power Plants in each houses in Scheduled Tribe Colony, Nadupathi, Palakad.
- Anert project is being implemented to make the electricity demand of 120 houses completely based on solar energy.
- **Nadupati Colony in Palakkad district will be the first tribal colony in India to be fully solar powered under net Metering scheme.**
- Fully constructed 85 Houses were already solarized.
- ANERT had also distributed **one induction stove** to each beneficiary as part of the project.

# Solar power plants in the houses constructed under Punargeham project of Govt of Kerala.

- Under the Green Income Project, ANERT had installed and commissioned 2 kW Grid Connected solar power plants in each houses constructed under Punargeham project (rehabilitating the families residing 50 mtrs from high tide line) of Govt of Kerala.
- Total of 86 houses were solarized at free of cost.

# Solar power plants in the houses constructed under Scheduled caste Development Dept.

- The project of installing solar power plants with a capacity of three kilowatts for free to 300 selected families constructed by the Scheduled Caste Department has been successfully completed.
- The amount required for this scheme in addition to the CFA is met from the scheme allocation of the State Government.



Total project cost per house is Rs.1,90,500/-. The CFA Rs. 57,382/-. An Amount of 1,33,117/- per house is spent by the State Government as beneficiary share.



At present, **305 houses** have been installed solar power plants with a capacity of 3 kW each



## Induction Cooktop in every houses

ANERT had provided one induction stove to each beneficiary as part of the projects.

If this induction stove is also used, the beneficiary can generate additional income by saving the cost of LPG

It is possible to make an income of around Rs. 6000 per year.





# Renewable Purchase Obligation

## Renewable purchase obligation:

Year	<u>RPO target</u>		<u>RPO achievement</u>	
	Solar	Non solar	Solar	Non solar
2020-21	5.25%	9.00%	2.61%	5.59%
2021-22	6.75%	10.25%	4.07%	9.38%
2022-23	10.50%	10.25%	5.51%	8.44%

The purchase obligation was never met until 22-23 as could be seen from the table. But for the Year 23-24, RPO required for various categories are

%	Wind RPO	HPO	Other RPO	Total
RPO in percentage	1.66 %	0.66%	24.81%	27.08%

As solar RPO is not specifically mentioned in the new MOP delegation, Hydel RPO can also be counted as net RPO and KSEB had already met the RPO criteria accordingly for the Year 23-24, if approved by KSERC. But KSEB is dedicated to continue its RE installations on social obligations even though no more RPO obligations are needed.

## **K. Awards/Accolades**

For the outstanding performance, KSEBL has received the following awards from government and non-government agencies.

- i) Re Asset India – outstanding performance in RE sector award winner 2022.
- ii) PV Invest Tech India Conference – Solar rooftop enabler of the year Award
- iii) APAC 3<sup>rd</sup> Digital Empowerment award from Uttar Pradesh Govt. & UPDESCO.
- iv) Suryacon Kerala annual solar awards - Outstanding Performance in Grid connected solar rooftop program.

The above process resulted in a golden figure of 100 MW capacity of Grid Connected Solar Rooftop well before 2023.. MNRE extended a special invitation in recognition to the remarkable achievement of KSEBL, in Delhi in front of all other state DISCOMS across the country. KSEBL received many awards as well for its outstanding performance in the Renewable Energy Sector.

**Following Projects are in progress to meet above vision.**

- **Grid integrated Rapid Solar EV Charging Hub with Solar canopy:** Green Rapid EV Charging Hub: A rapid charging hub with solar canopy having 10nos. 120kW dual gun chargers and 120kW Solar Canopy is planned opposite to Kaloor Metro Station. The Bureau of Energy Efficiency (BEE) has sanctioned 1.5 Crore rupees for setting up of this demonstration project.
- **Induction-Based Wireless Electric Vehicle Charging in Kerala Roads with RE integration:** The proposed pilot project aims to implement induction-based wireless electric vehicle (EV) charging infrastructure on the roads of Kerala. The initiative will be led by KSEBL, the State Nodal Agency with pan Kerala Power and Charging Station network in a fully integrated manner. This will foster the widespread adoption of electric vehicles, reduce carbon emissions, and promote sustainable transportation across the state. This project seeks to establish a robust, efficient, and convenient charging network that will support the growing EV market in Kerala.

- **RE assimilated Electrified motorways:** Catenary system with overhead wires. Conductive charging utilizing a metal plate on the vehicle along National Highways. Being the State power utility with electrical infrastructure available all across the State and along National Highways, only KSEBL can implement such alternatives
- **Battery Energy Storage System (BESS):** – Pilot project 10MW/20MWH- Life 12yrs- at 220 kV substation , Mylatty.
- **Vehicle to Grid (V to G) project:** A pilot Vehicle to Grid (V2G) project proposal has been entrusted with KSEBL by Government of Kerala, through ISGF (Indian Smart Grid forum).
- **Carbon Credits:** KSEBL can earn revenue by selling carbon credits generated from the RE sources. 10\$ per credit is expected in the voluntary market. (1Carbon Credit= IMT of Co2 removal from atmosphere.) Initial discussions are over and a road map is set in position so as to earn credits from current Year onwards.

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# A Three tier full fledged Tracking Portal

Solar Rooftop Portal – Kerala State Electricity Board Email: [sourahelpdesk@gmail.com](mailto:sourahelpdesk@gmail.com)  
Call Now: 1912 | [+919496266631](tel:+919496266631) | [+919496018370](tel:+919496018370)

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**“വർഷാന്ത്യ സ്പെഷ്യൽ സൗര സബ്സിഡി സ്കീം”**

സൗര സബ്സിഡി പദ്ധതി

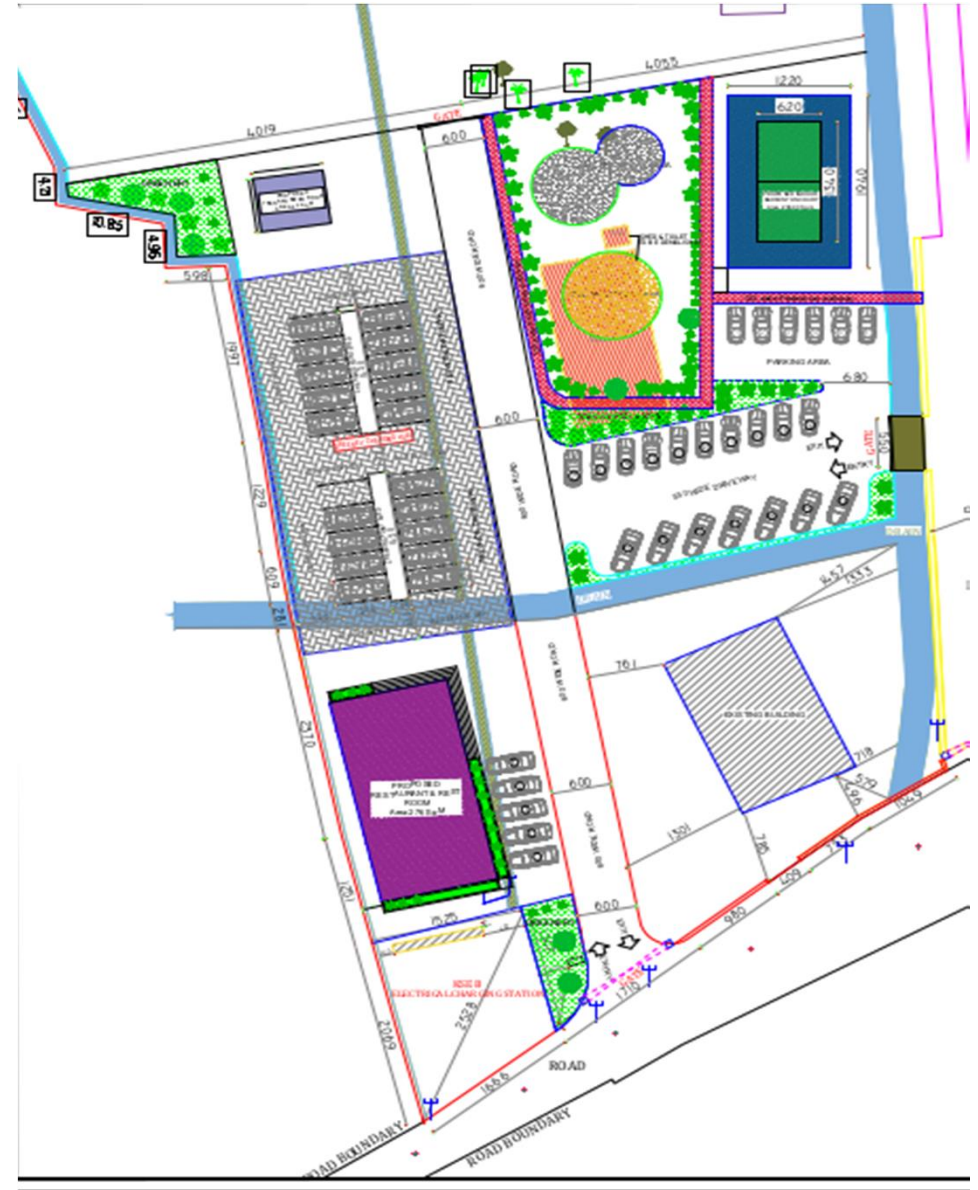
**പുരപ്പുറ സൗരോർജ്ജ നിലയം സ്ഥാപിക്കാൻ 40% വരെ സബ്സിഡി**



# KALOOR CHARGING HUB

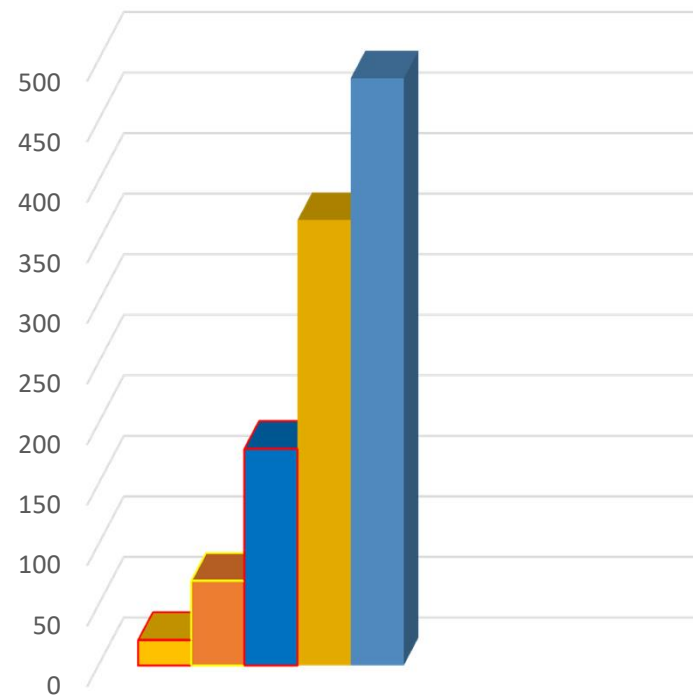
## Another RT venture by KSEB

1. **20 Vehicles** at a time
2. **120 kW** Solarised roof
3. BEE, MoP sanctioned **Rs. 1.5 Cr** under demonstration project.
4. Estimated Cost- **Rs.5 Cr**
5. Remarks from the FA received
6. Chief Engineer visited site
7. Detailed Civil/ Electrical estimate received from TC Kalamassery



# EV Charging – Power requirement by 2030.

Power requirement



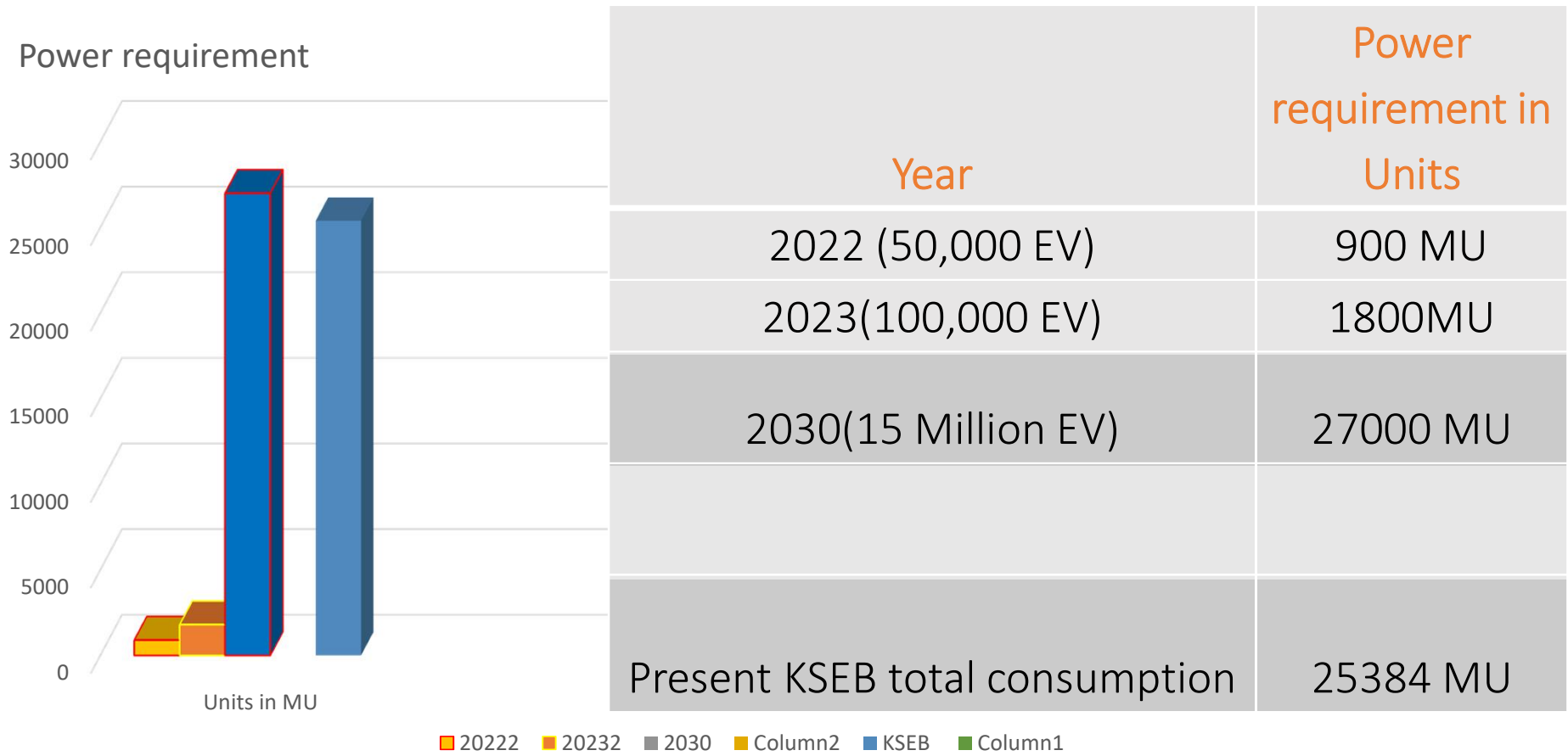
EV stations other than KSEB

■ 2020  
 ■ 2021  
 ■ 2022  
 ■ 2023  
 ■ 2023 April to September  
 ■ Column1

Year	EV stations
2020	21
2021	70
2022	179
2023	368
2023 April to Sep	485



# EV Charging – Power requirement by 2030.



# Battery Assisted Street Lamp Unit (BASLU)



- BASLUs can play a significant role in peak power management.
- BASLUs have batteries inside that can store energy during the day and release it at night.
- This can help to reduce peak demand on the grid and improve reliability.
- The proposal is under consideration for pilot project for proof of concept.
- Solar Power can be utilized for charging batteries.

# From KSEB, ANERT & EMC

THANK-YOU

CONTACT US

Visit: [www.kseb.in/ekiran.kseb.in](http://www.kseb.in/ekiran.kseb.in)

Call/WhatsApp at +91 9496018370/9496266631

Email: [sourahelpdesk@gmail.com](mailto:sourahelpdesk@gmail.com)

[sourakseb@gmail.com](mailto:sourakseb@gmail.com)

