

**NCCD National Level Conclave with State Officers  
on Cold-chain Development  
9-May-2014 at New Delhi**

**Alternate Energy Options for  
Strengthening  
Energy Efficiency for Cold Storage**

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# Highlights

- **Current Scenario**
- **Need of Alternate Energy solutions**
- **R E Technological options**
- **Techno-economic adoption**
- **Pilot projects**
- **Other R E solutions for food processing**
- **Role of Ministry**
- **Expected impact and outcome**

# Current Scenario

- India is the largest producer of fruits and milk
- Second largest producer of vegetables
- Third largest producer in the fishing sector in the world.

Problem	Solution
<p>Post harvest losses : 25 – 30% ; Due to lack of proper storage and transit facility</p>	<p>Perishable produce requires cold chain arrangement to maintain quality, extend shelf life.</p>
<p>No access to grid power, Unreliable grid power supply, Storages use grid power hybridized with DG sets</p>	<p>Alternate energy sources to complement grid tied storages, also projects have been developed to feed back into the grid</p>

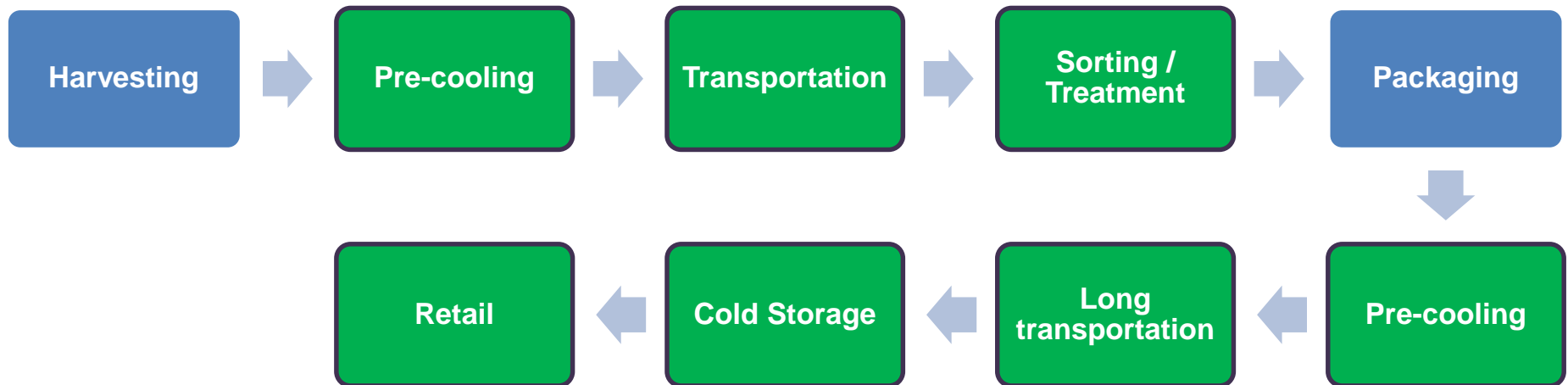
# A typical cold chain

## An alternate approach

The renewable energy technologies can be integrated based on three key factors such as:

- the Stage in the cold chain
- the Type of stock to be processed
- the energy Load requirement for the desired infrastructure

Areas where alternate energy option can be applied



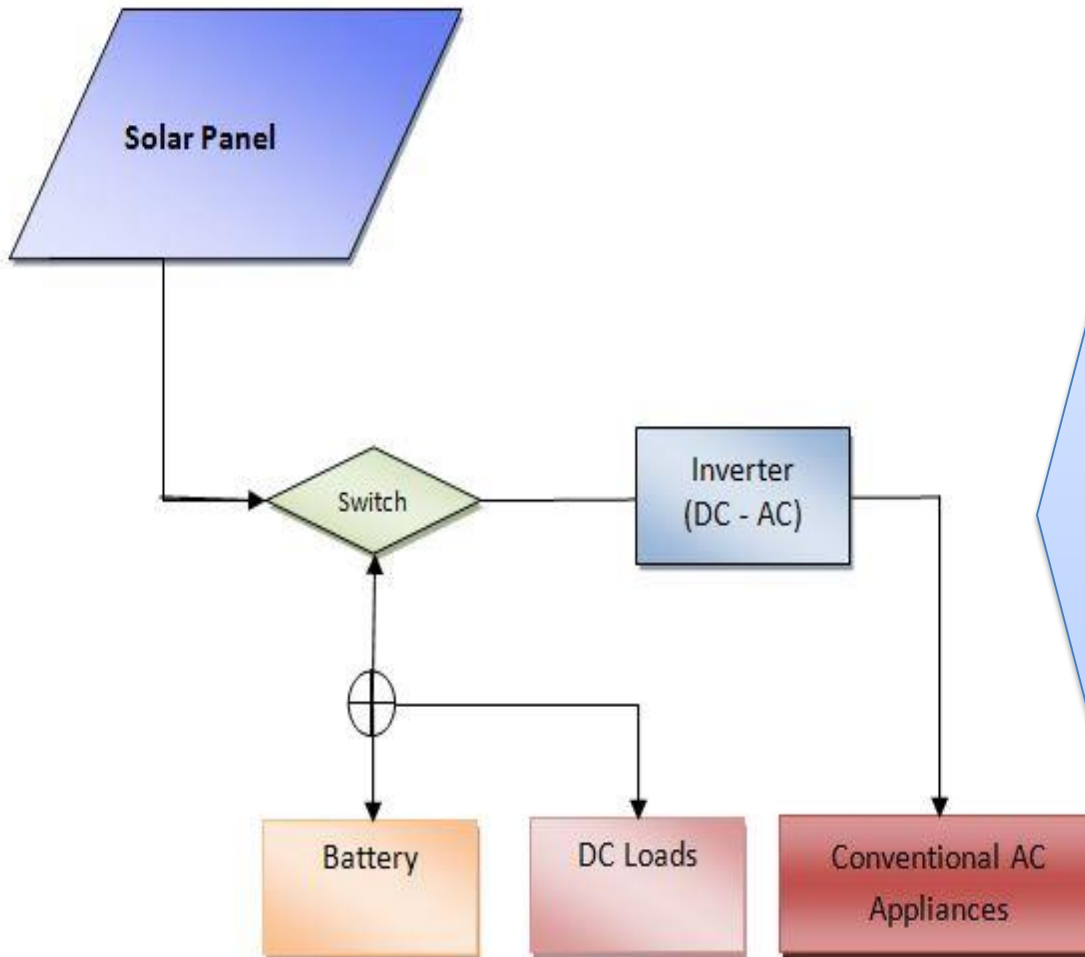
Applying renewable energy options will ensure self sustained, environment friendly, economical development of GREEN COLD CHAIN in long run facilitating further the increasing production.

# **RE Technological options**

- ***Solar Photovoltaic Power Pack***
- ***Solar PV + PCM***
- ***Solar PV System + Diesel Gen-set Hybrid***
- ***VAM Using Solar Thermal Energy***
- ***Biomass Gasifier***
- ***Solar/Biomass Co-generation (Power and Cooling)***

**These are some ready and proven options available**

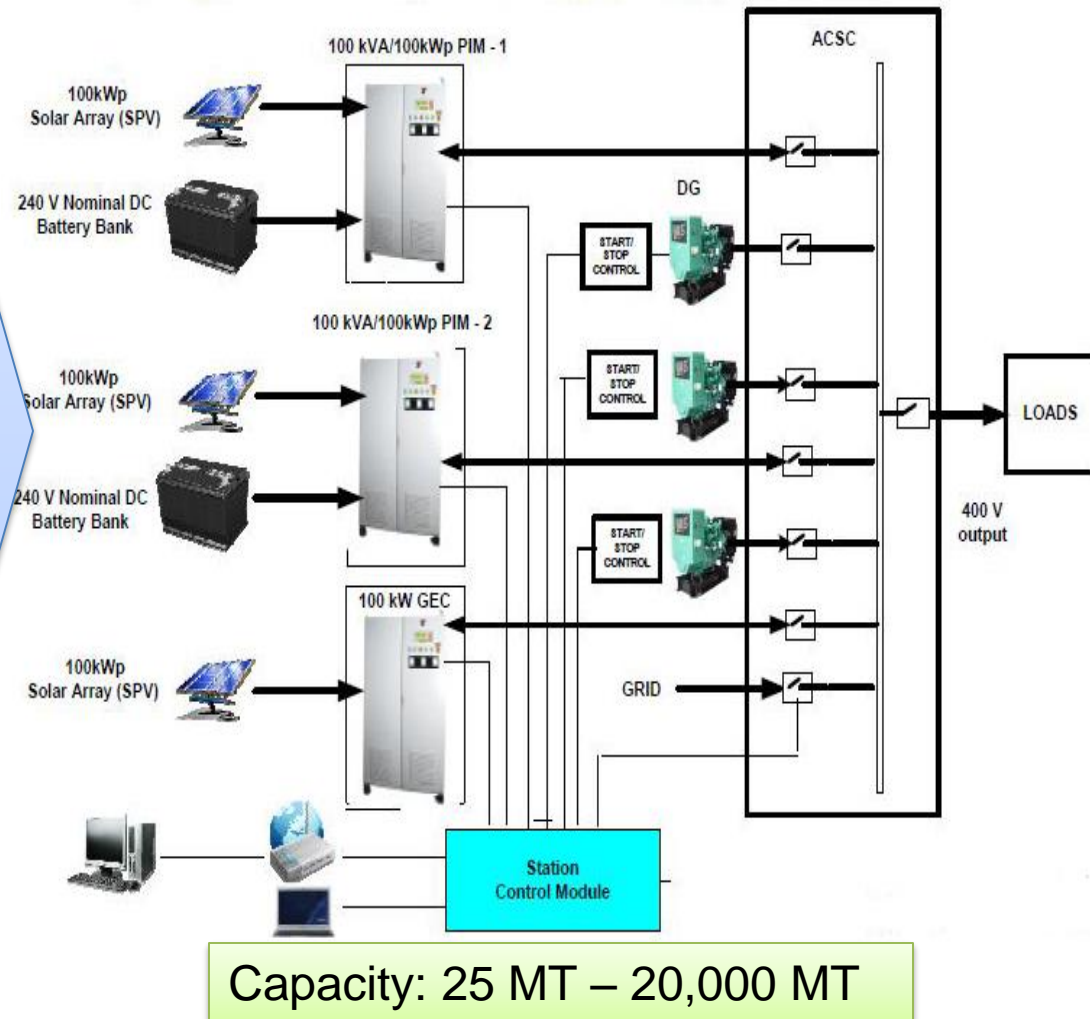
# Solar Photovoltaic Power Pack



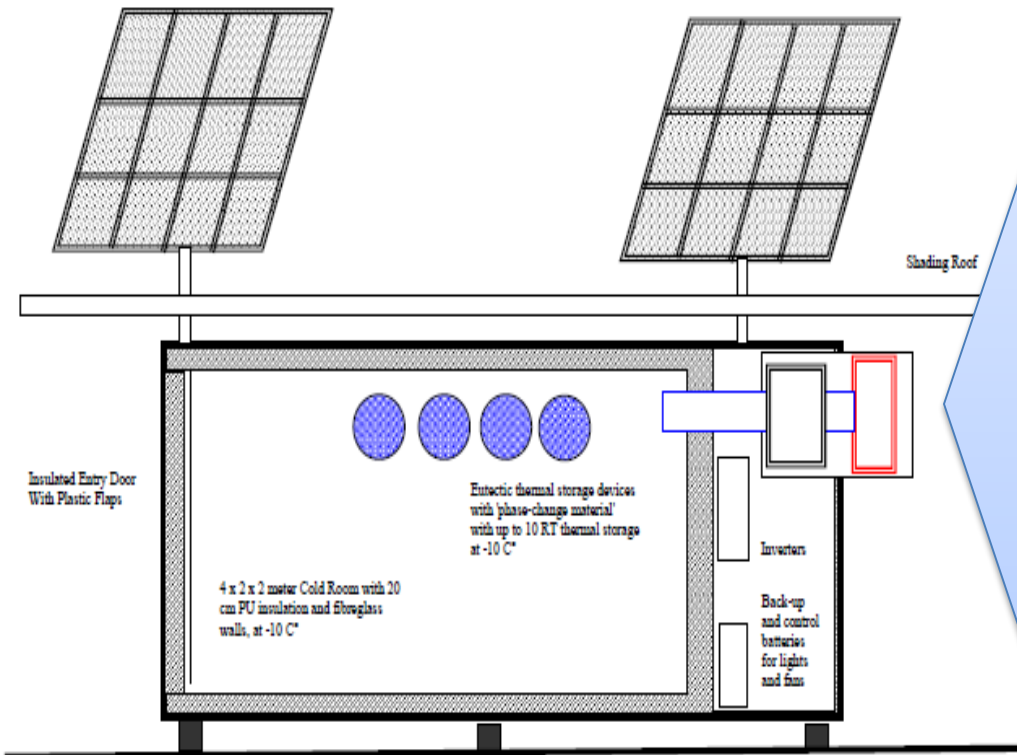
- Power Pack systems are used to generate electricity for locations where grid is unreachable or access is expensive.
- It is a PV based solar energy system, where solar energy is converted into electrical energy and used for refrigeration much like conventional methods.
- These Solar Power Pack Systems can also be used in combination with existing grid for uninterrupted supply of electricity.

# Solar PV + Diesel Genset Hybrid

- Solar PV can be coupled with existing DG set to supply electricity for base load & minimum reefer load.
- During non availability of grid power the electricity generated by PV can be utilised hence minimising the energy cost.
- Pilot projects are operational at various locations so as to hedge the cost of diesel with the help of smart controlling to prolong temperature maintenance.



# Solar PV + PCM



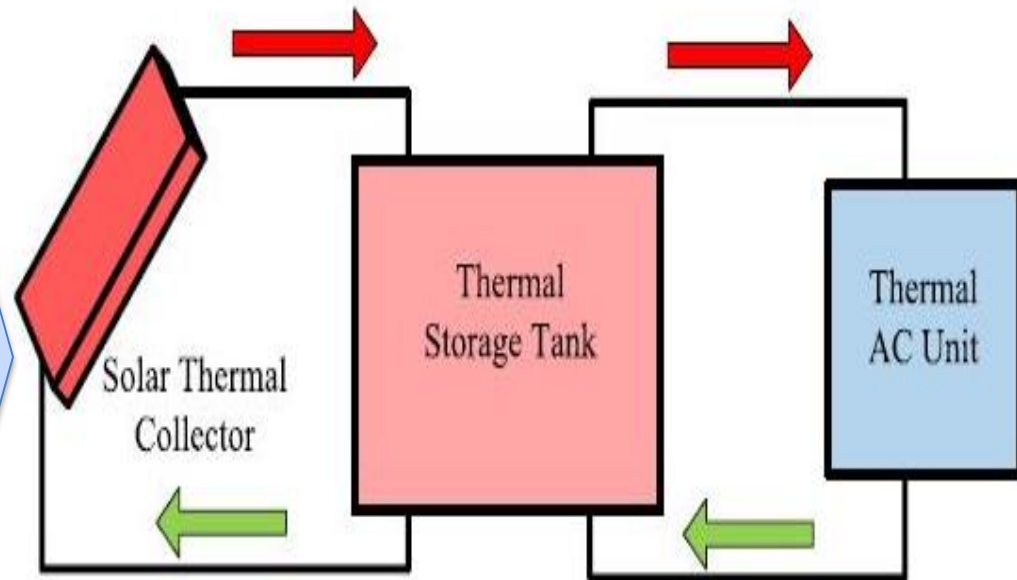
Capacity: 5 T – 12 T

These systems are used to generate electricity through solar PV to drive the compressor and also maintain the required temperature with the help of Phase Change Material so as to minimise the load on the compressor.

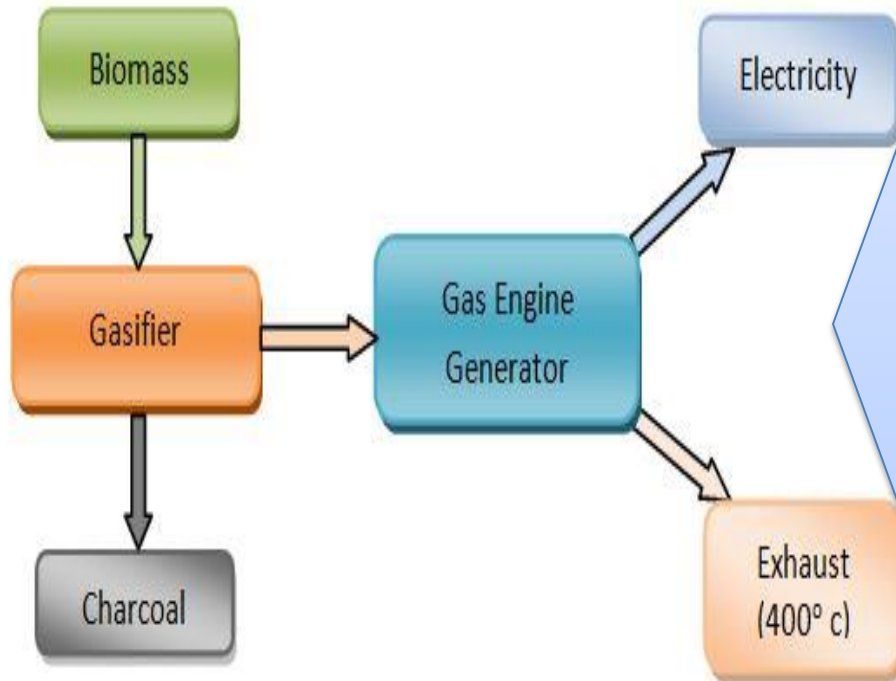


# *VAM Using Solar Thermal Energy*

- Thermal solar cooling is becoming more popular because a thermal solar collector directly converts light energy into heat.
- As a result, the refrigerants inside the collector evacuated tubes become hot through a heat convection process.
- The hot water (feed) for VAM can also be provided by Solar Water Heater and gas geysers hence saving a lot of electricity for the purpose of refrigeration.



# ***Biomass Gasifier***

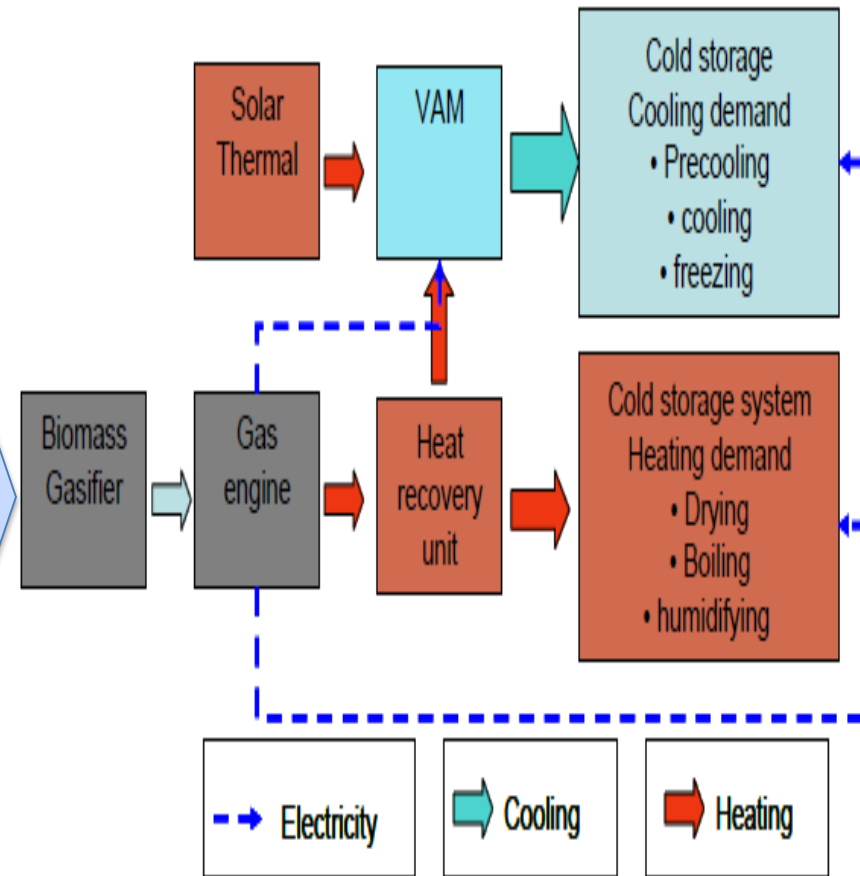


Capacity: 5,000 MT

- Existing generators are fed with gas from biomass to produce electricity.
- A viable option for decentralized electricity production, especially in village areas where grid is not available and lot of perishable stock is readily available.
- This setup can provide cold storages with electricity even in standalone mode.

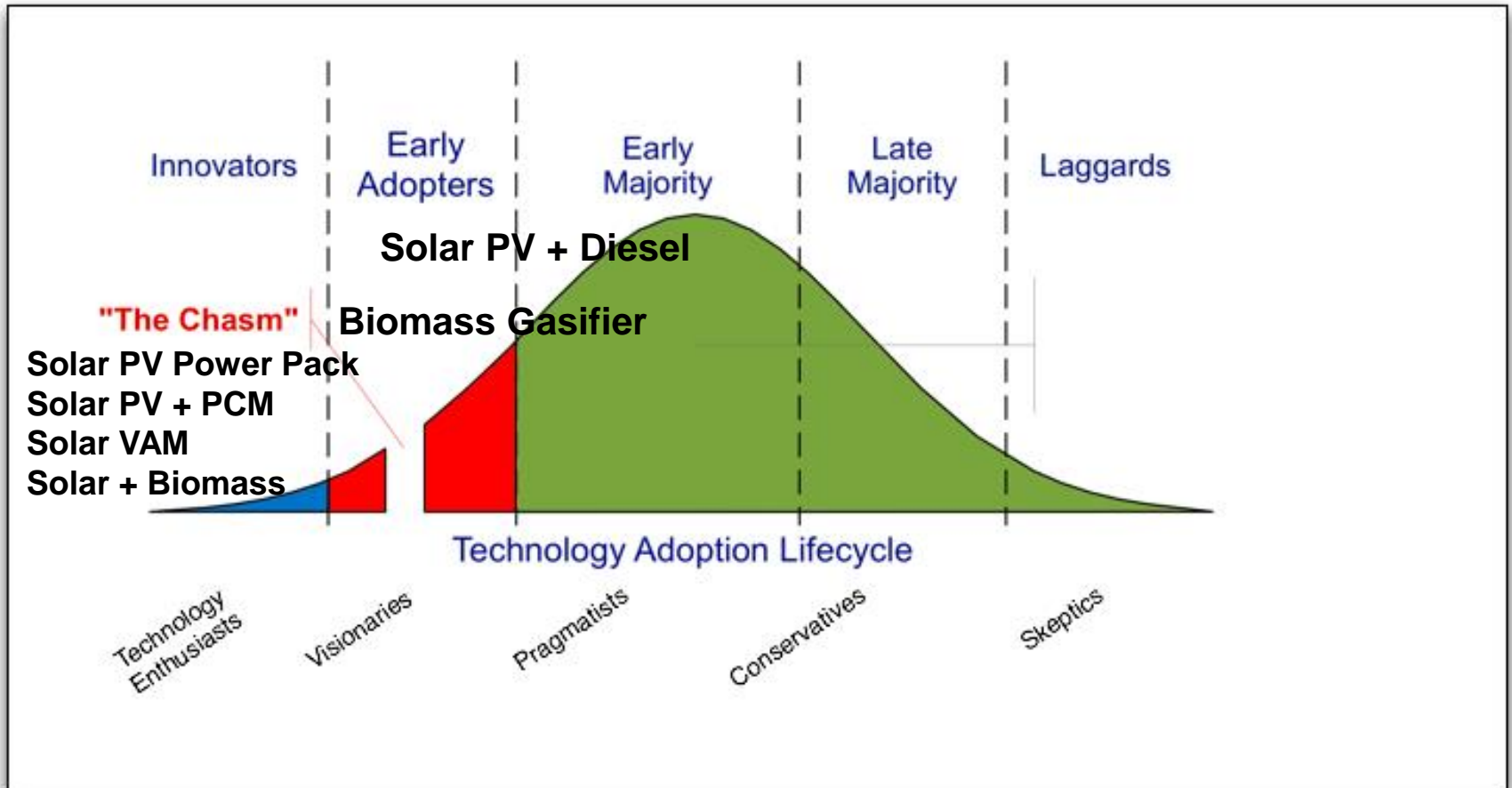
# Solar/Biomass Co-generation (Power And Cooling)

- Producer gas from Biomass Gasifier drives gas engine to produce electricity required to drive the system.
- A Vapour Absorption Machine (VAM) is driven on the engine waste.
- The solar thermal collectors supplement the heat to the vapour absorption system during day time.
- The balance heat available from the engine can be utilized for drying, humidifying, sanitizing needs of the cold storage.



Capacity: 20 MT (can be increased manifold)

# Techno-economic adoption



**Visionaries lead the way, to what will soon be a standard.**

# Pilot projects

## Successful implementations

Technology	Technology partners	Project location
Solar PV System + Diesel Gen-set Hybrid	MARFIN	167 Projects executed in Bihar and North East
Solar Thermal-Biomass gasifier	TERI -Thermax-MNRE	Solar energy Centre, Gurgaon
Biomass gasifier	MNRE initiative in Bihar	7 Cold storages running in Bihar of capacities upto 5000MT

# Other R E solutions for food processing

Solar thermal technologies can also be used for other processes requiring (temperature up to 150<sup>0</sup> C) such as **Cleaning, Blanching, Dehydration and Drying.**

Various projects under these technologies have been running successfully throughout the country. Some of the key projects:

Process	Temp.	Technology	Few existing projects
Blanching/ Pasteurization	70	FPC	Mahanand Dairy, Chitale Dairy
Dehydration	70 – 80	ETC (Air heater)	55m <sup>2</sup> area solar for mango concentrate at Eluru, Andhra Pradesh
Drying	70 – 80	ETC (Air heater)	9 tea factories having a total collector area of 2,420m <sup>2</sup> Over 150 installations by SEED Chief Horticulture Office, Ladhakh & Kargil

# Role of Ministry

- **Promoting various technological options**
- **Preparing DPRs and assisting on technological aspects**
- **Greater synchronization and synergy in between various ministries and departments**
- **Promoting and enabling policy formulation and integration of RE in various policies**

# Expected impact and outcome

- **Maximize Price Realisation (farmers / storage owners)**
- **Prevent Wastage**
- **Improve Shelf Life (Exotic flowers/vegetables)**
- **Improve Productivity**
- **Reduction in dependence on conventional energy**
- **Reduce logistics cost**





Thank you!

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