Green Capital Market opportunities

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Climate Bonds Initiative

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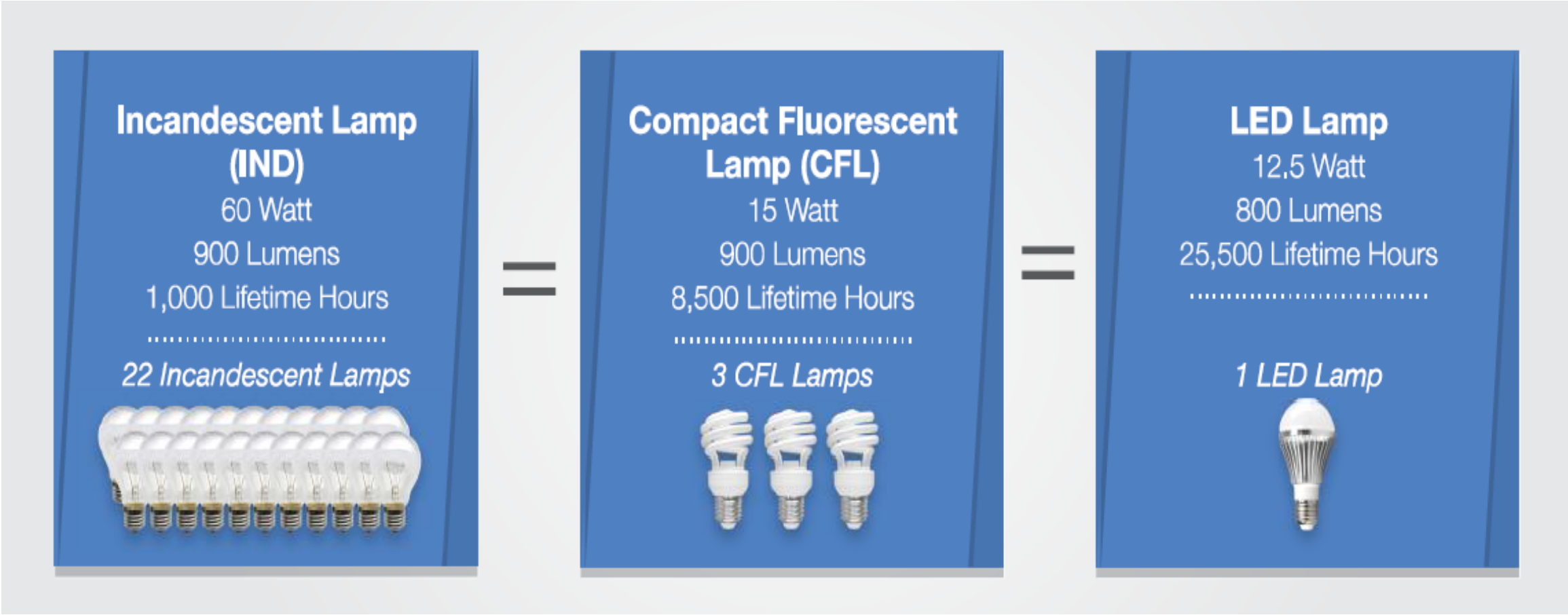
Opportunity 1

- Energy Efficient street lamps.

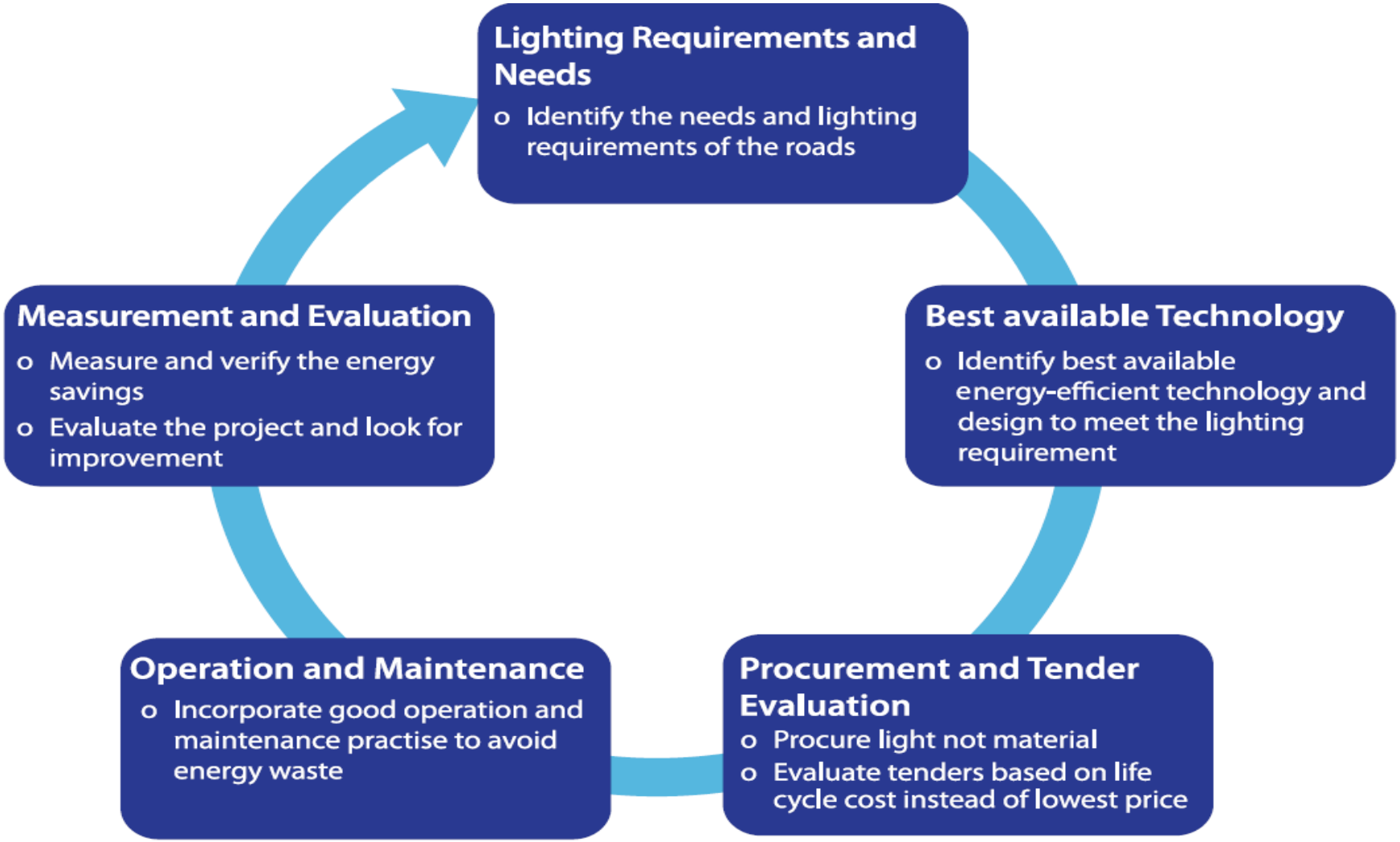
The Case for replacing existing street lamps with LEDs



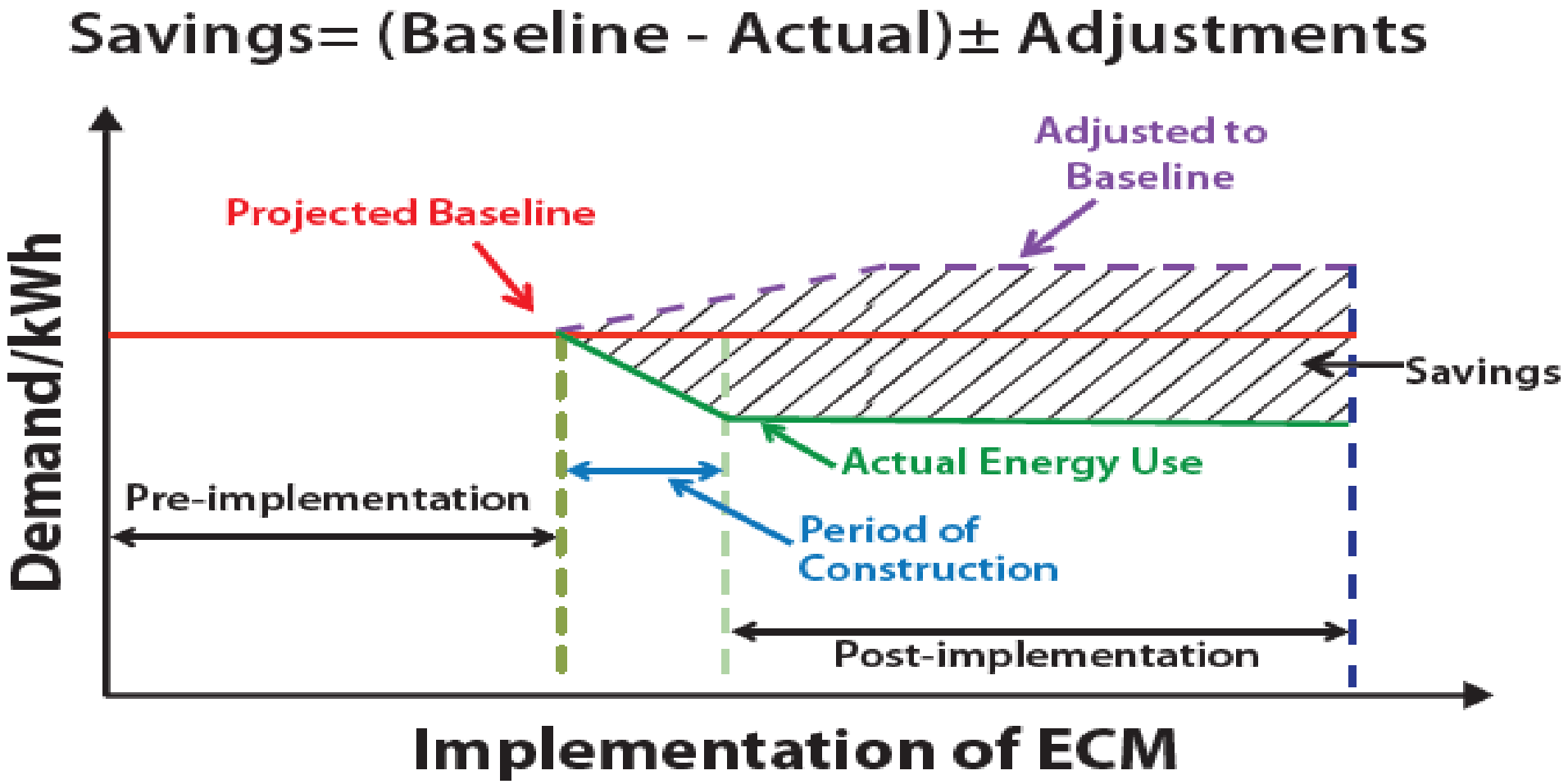
Better controls give additional savings

Before modernization:	After modernization:
> High pressure mercury lamps (80 W) > Standard Control > Partial light level reduction	> LED (26 W) → 70% energy savings > Single light point control > Presence detector → 30-35% savings
 *Source: Stadt Norden*	 *Source: Stadt Norden*

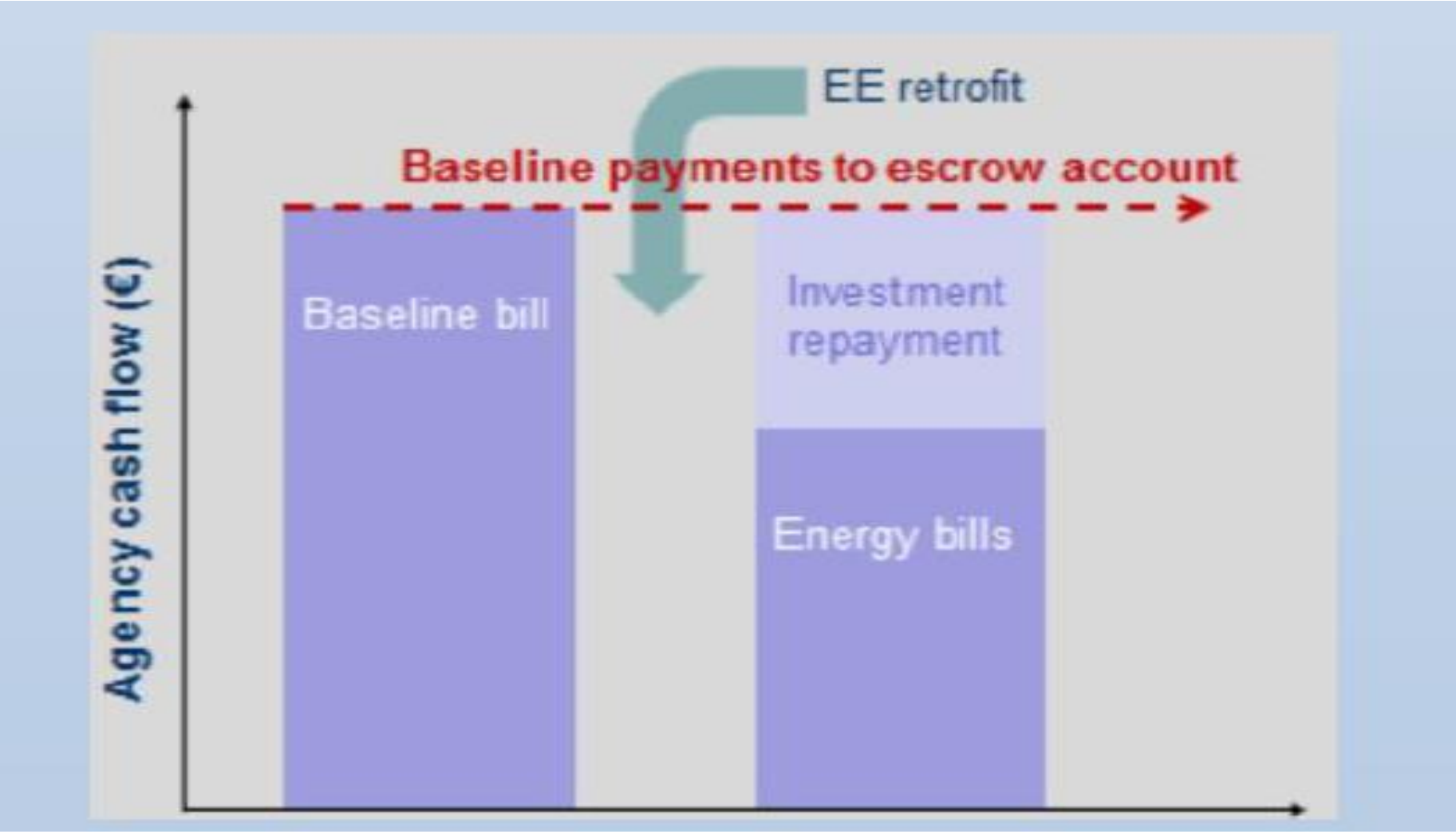
Established Process



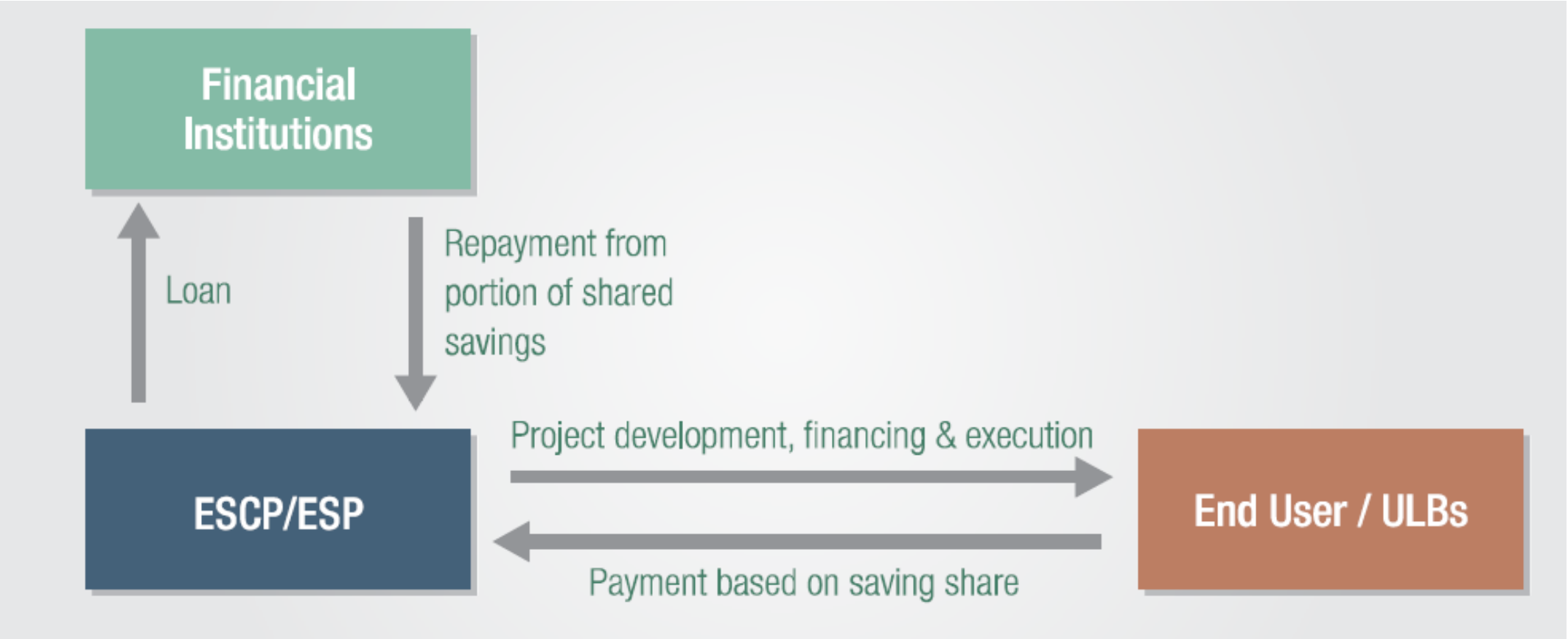
Energy savings……..



…..to pay for the capex



Loan/ Bond & Payback



Bulk procurement has reduced prices of LEDs

Opportunity 2

- Solar PV installations on Rooftops.

- Inputs from

Decentralized renewables are key to meeting India's national target and enabling energy access

Significant thrust needed on solar rooftop to achieve INDC targets

- India has set an ambitious target to achieve 175GW installed capacity of RE by 2022, of which 40GW as rooftop solar /small power plants
- USD 30bn investments required

Off-grid systems needed to complement grid intensification for sustainable energy access

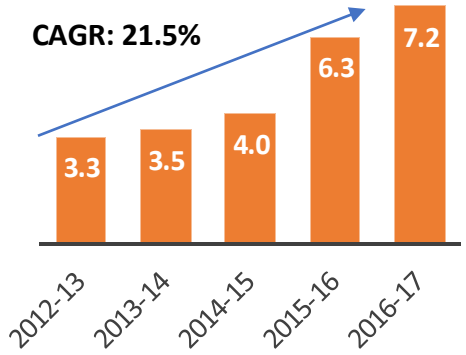
- **44 million households (~220 million people) remain un-electrified**
- Need for an alternate source (other than central grid) for almost 1.2 GW capacity at basic lifeline consumption alone

DRE solutions seeing an increasing uptake and emerging as a distinct sector in financing domain

1.7GW of solar rooftop capacity installed[1]

Note: 1) As of August 2017; MNRE SNS briefing August 2017

Private Sector Mini-grids Installed Capacity (MW)



Private sector fund flow for DRE

Deployed over FY2013-2016

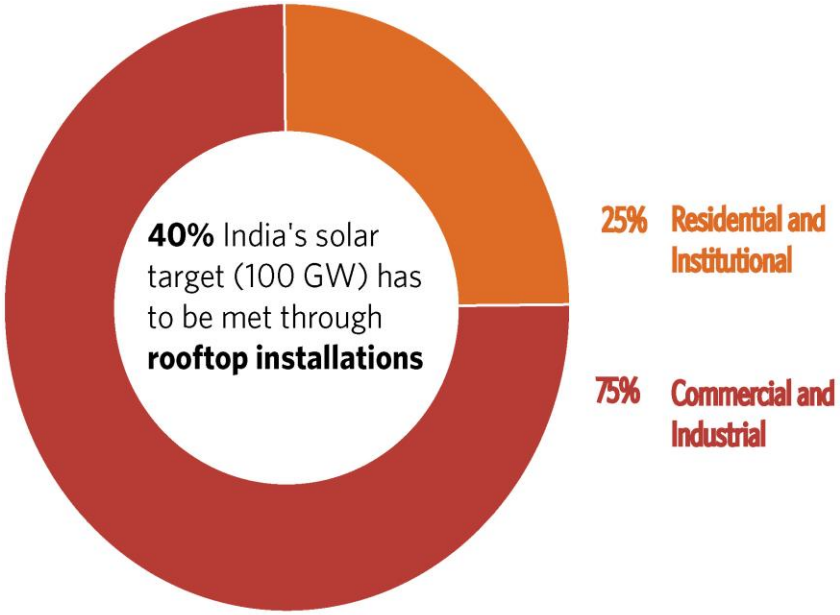
- USD 70mn in DRE energy access
- USD 300mn in solar rooftop RESCO model

Available to be deployed in near term

- USD 150mn for DRE energy access
- USD 3.8bn for solar rooftop RESCO model

India’s energy targets and investment requirement

- India has set an ambitious target to achieve 175 GW installed capacity of Renewable Energy (RE) by 2022
- 40% of the Govt. of India’s solar installation target for 2022 to be met through Rooftop Solar (RTS)
  - **30 GW target to be met through commercial and industrial consumers**
  - 10 GW target through residential and institutional rooftop consumers
  - Target represents ~10% of the overall rooftop solar potential of India



- Estimated **USD 189 billion** investment requirement for RE and **USD 30 billion** for RTS

Role of RTS in India

- RTS projects play an important role in mitigation and in improving quality energy access in India

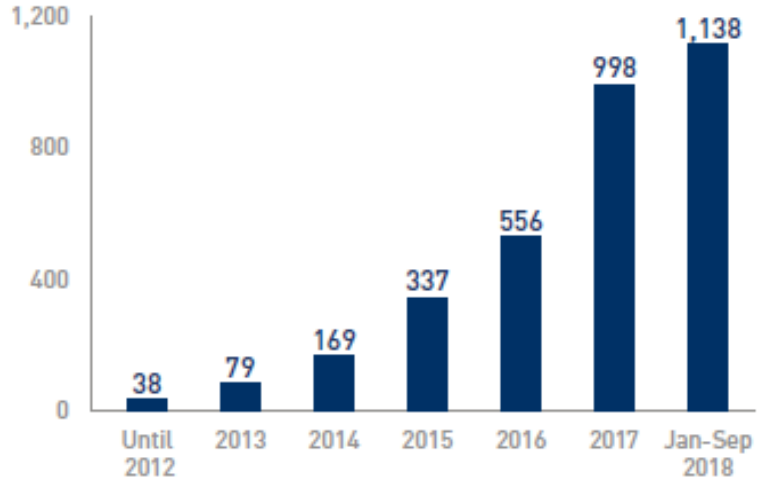
- Ranked as the 10th most substantive climate solution, out of 80 solutions based on environment and economic benefits, by Drawdown- a US based non-profit organization
- Critical for India's energy transition and to improve energy security

Rank	Solution	Sector	TOTAL ATMOSPHERIC CO2-EQ REDUCTION (GT)	NET COST (BILLIONS US $)	SAVINGS (BILLIONS US $)
1	Refrigerant Management	Materials	89.74	N/A	$-902.77
2	Wind Turbines (Onshore)	Electricity Generation	84.60	$1,225.37	$7,425.00
3	Reduced Food Waste	Food	70.53	N/A	N/A
4	Plant-Rich Diet	Food	66.11	N/A	N/A
5	Tropical Forests	Land Use	61.23	N/A	N/A
6	Educating Girls	Women and Girls	51.48	N/A	N/A
7	Family Planning	Women and Girls	51.48	N/A	N/A
8	Solar Farms	Electricity Generation	36.90	$-80.60	$5,023.84
9	Silvopasture	Food	31.19	$41.59	$699.37
10	Rooftop Solar	Electricity Generation	24.60	$453.14	$3,457.63
11	Regenerative Agriculture	Food	23.15	$57.22	$1,928.10
12	Temperate Forests	Land Use	22.61	N/A	N/A
13	Peatlands	Land Use	21.57	N/A	N/A
14	Tropical Staple Trees	Food	20.19	$120.07	$626.97

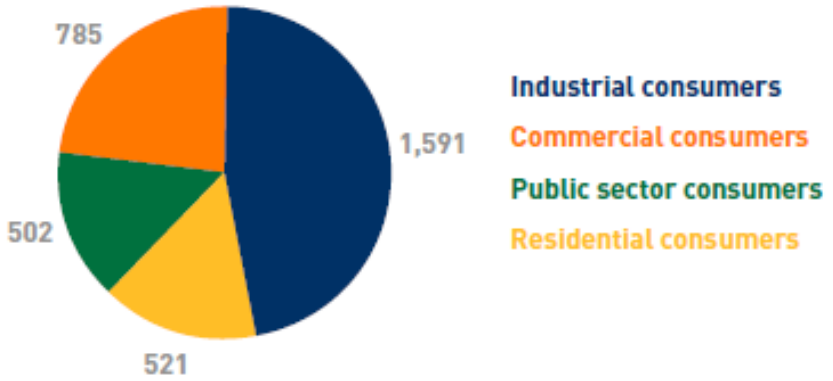
RTS- Current Scenario

- Installed capacity at 3.4 GW as of Sep 2018, with a CAGR of ~68% over the past 2 years
- Commercial and industrial segment (C&I) remains the biggest market segment with 2.3 GW installed capacity, followed by Residential (521 MW) and public sector (502 MW)
- Capex has been the preferred model historically. Opex gaining traction with 35% of the total installed capacity in 2018 as against 10% in 2015
- Maharashtra leads the rooftop solar installation in the country with 500 MW, followed by Tamil Nadu and Karnataka

Annual Capacity Installation (MW)



Source: Bridge to India



Source: Bridge to India

Rooftop (C&I) is required to grow at a CAGR of 90% to achieve its target by 2022

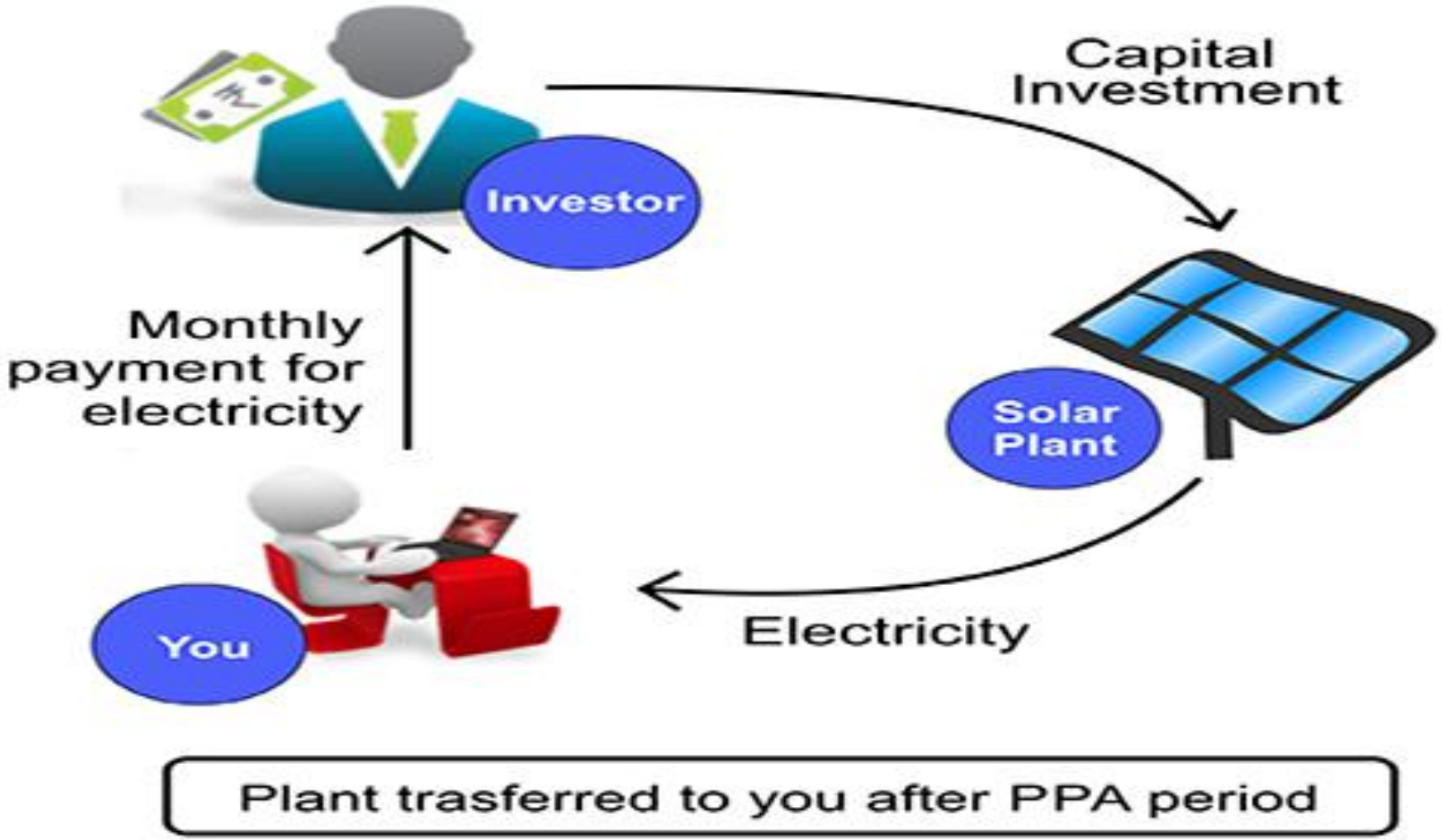
Capex & Opex

……Capex & Opex

DIFFERENCE BETWEEN CAPEX-OPEX(RESCO Model)

Plant with own Investment	Zero Investment
Payment in EMI or Lumsum	Payments as per PPA(Power Purchase Agreement)
Duration as per loan terms	Duration with mutual understanding between investor and user.

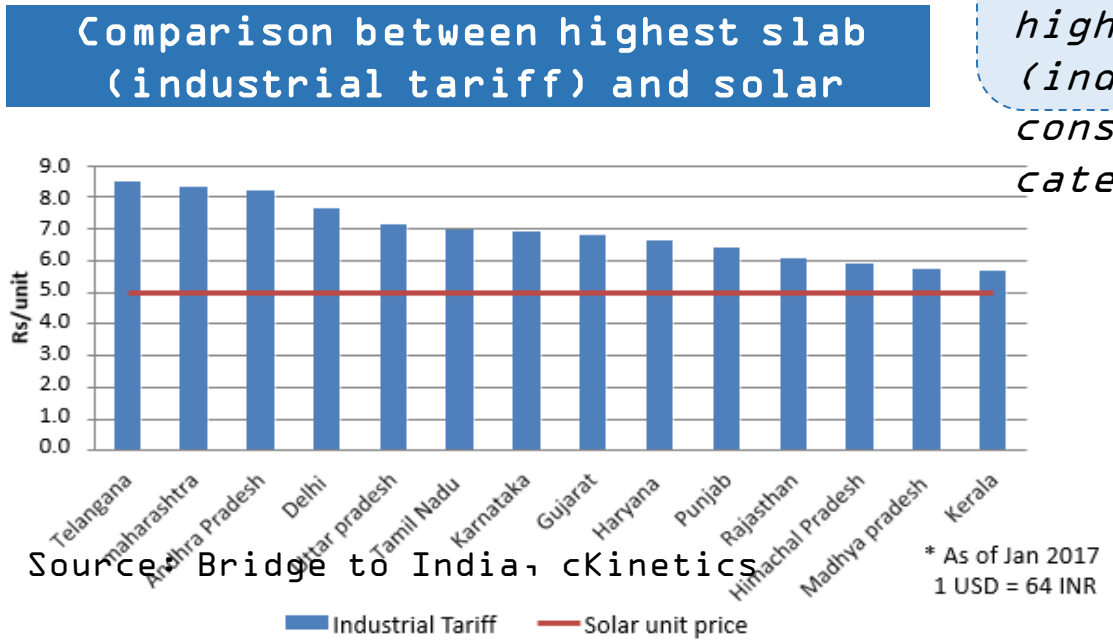
Opex(RESCO) Model…



Investment Opportunity: Drivers for RTS

- Economic viability for C&I customers through RTS across all key states
- No concentration risk; better energy security
- Grid tariffs for C&I continues to be high: limited grid infrastructure, High AT&C losses, subsidization for res/ agri; increasing trend in average cost of power purchase for DISCOMS

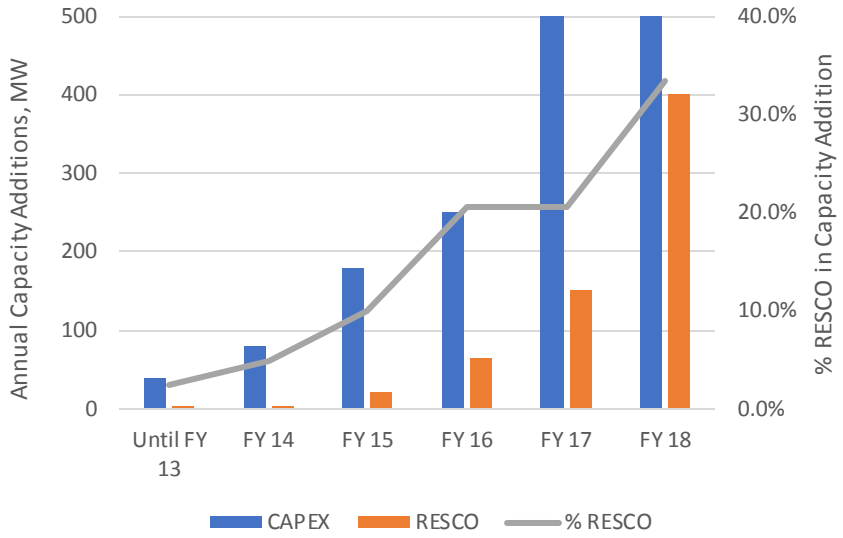
All states have achieved parity for Solar rooftop against the DISCOM's highest slab (industrial consumer category)

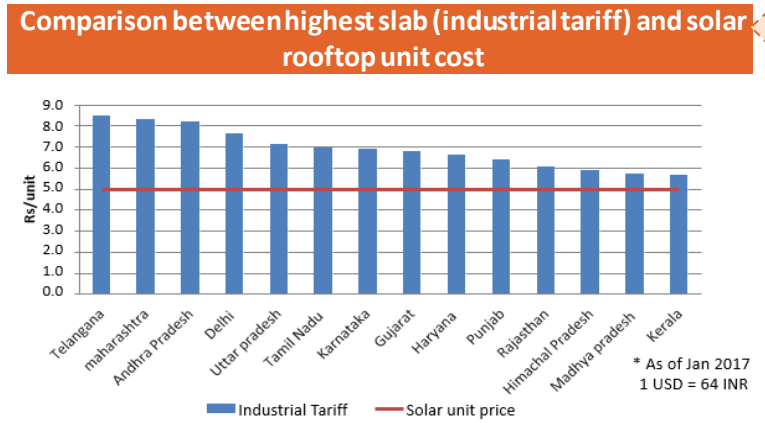


Source: Bridge to India, cKinetics

- Converging capital costs for RTS and utility projects expected to drive better returns for RTS players (higher tariffs from C&I compared to sale to discoms)
- With falling energy storage costs, RTS combined with storage to result in an increasing trend in grid disintermediation
- Potential investment opportunities across Capex, Opex and dedicated financing intermediaries for RTS

Drivers for RESCO(OPEX) model





All states have achieved parity for Solar rooftop against the Discom'shighest slab (industrial consumer category)

Source: Bridge to India, cKinetics

- Significant increase in OPEX share as part of the annual capacity installation over the years 2013 to 2018. OPEX share currently at 34% of the total cumulative rooftop solar installations

- The RESCO share of the market is expected to continue to grow given:
  - No upfront capital required from the customer which is the biggest driver for demand
  - Payment linked to generation improves quality and reliability
  - Attracts professional investment capital

- Value Added Services can offer better monitoring of load and consumption with energy data analytics - allowing customers to see their load pattern and take necessary steps to reduce their day time consumption.

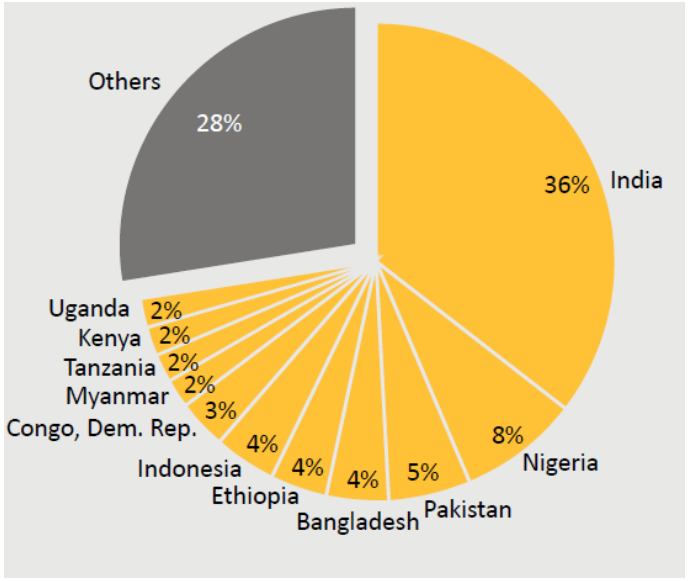
Opportunity 3

- Devices powered by Solar PV installations

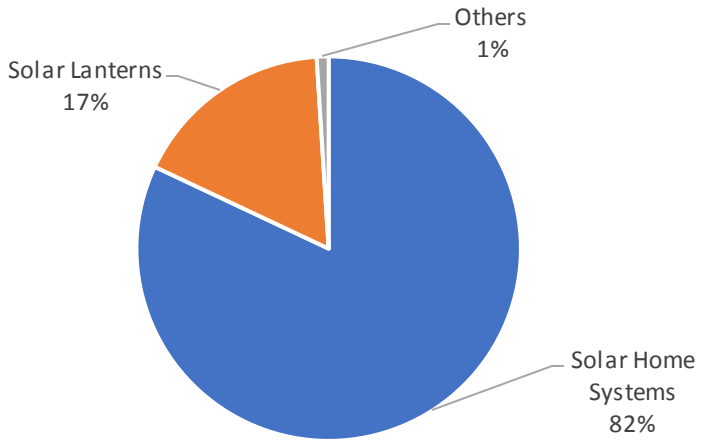
- Research Inputs from

Off-grid Solar Products

Global potential market of 434 mn HH



Annual Market size of US$ 591 mn



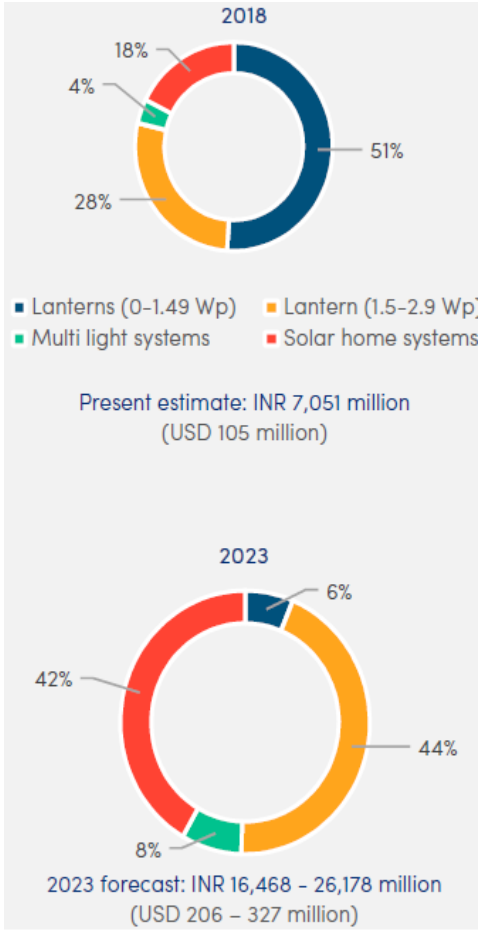
Source: IFC GOGLA report 2018; dlight

Key Players

- India is estimated to have the largest off grid solar product market in the world with cumulative sales of ~32 mn units over past three years. Sector grew at 34% annually during the period 2014-16
- ~70 companies are active in the segment in India. However, very few companies were able to raise large-scale funding for operations in India (Simpa, dlight, Greenlight Planet etc.)
- While Solar Home Systems (SHS) market constitutes 82% of the off-grid solar product market, penetration in the segment is low
- PAYGO SHS has seen a slow uptake due to low penetration in the digital payments

Projected Growth of Devices powered by Solar PV

	2018 Units estimated	2023 Range of units estimated
Lanterns (0–1.49 Wp)	6.2 million	2 – 2.7 million
Lanterns (1.5–2.9 Wp)	1 million	3.1 – 3.8 million
MLS	53,000	200,452 – 312,692
SHS (100 Wp) including DC fans	39,903	100,803 – 112,901
SHS (200–300 Wp) including DC fans and DC TVs	8,042	55,226 – 154,634
SHS (400 Wp) including DC fans, DC TVs and DC refrigerators	3,889	26,708 – 53,416
DC Fans	16,209	87,417 – 130,400



The Financing & capital markets opportunity

	Global Off Grid SHS market sales	
	Sold in Cash	Sold with PAYG financing
Number(Million)	2.93	0.73
Value(USD Million)	107.5	110.89
Average value per unit (USD)	36.7	151.91

India remains the largest country market in the cash segment with 1.3 million products sold for a value of $37 million, accounting for 44% of the cash sales globally.

MFI ‘s or Banks ability to offer financing has been limited.

Opportunity 4

- Climate Resilient agriculture.

Inputs from

Nanded Project – Climate Smart Agriculture

Climate smart agriculture aims to tackle three main objectives

reducing and/or removing greenhouse gas emissions

adapting and building resilience to climate change

sustainably increasing agricultural productivity and incomes

Turmeric Farming Nanded

The over-arching goal of the Nanded programme is to contribute in enhancing climate resilience and adaptive capacities of vulnerable families by leveraging outcomes from the pilot initiatives to scale up to the entire district

- Pilot with 5000 turmeric farmers
  - Slowly transitioning to natural farming
  - Package of practices to transition to organic farming
  - Guaranteed buyback
- Pilot with 500 women farmers to grow organic vegetables, with a guaranteed buyback in place

Turmeric Farming Nanded

The project is being developed by **VNV Advisory Services** and **Nandigram**

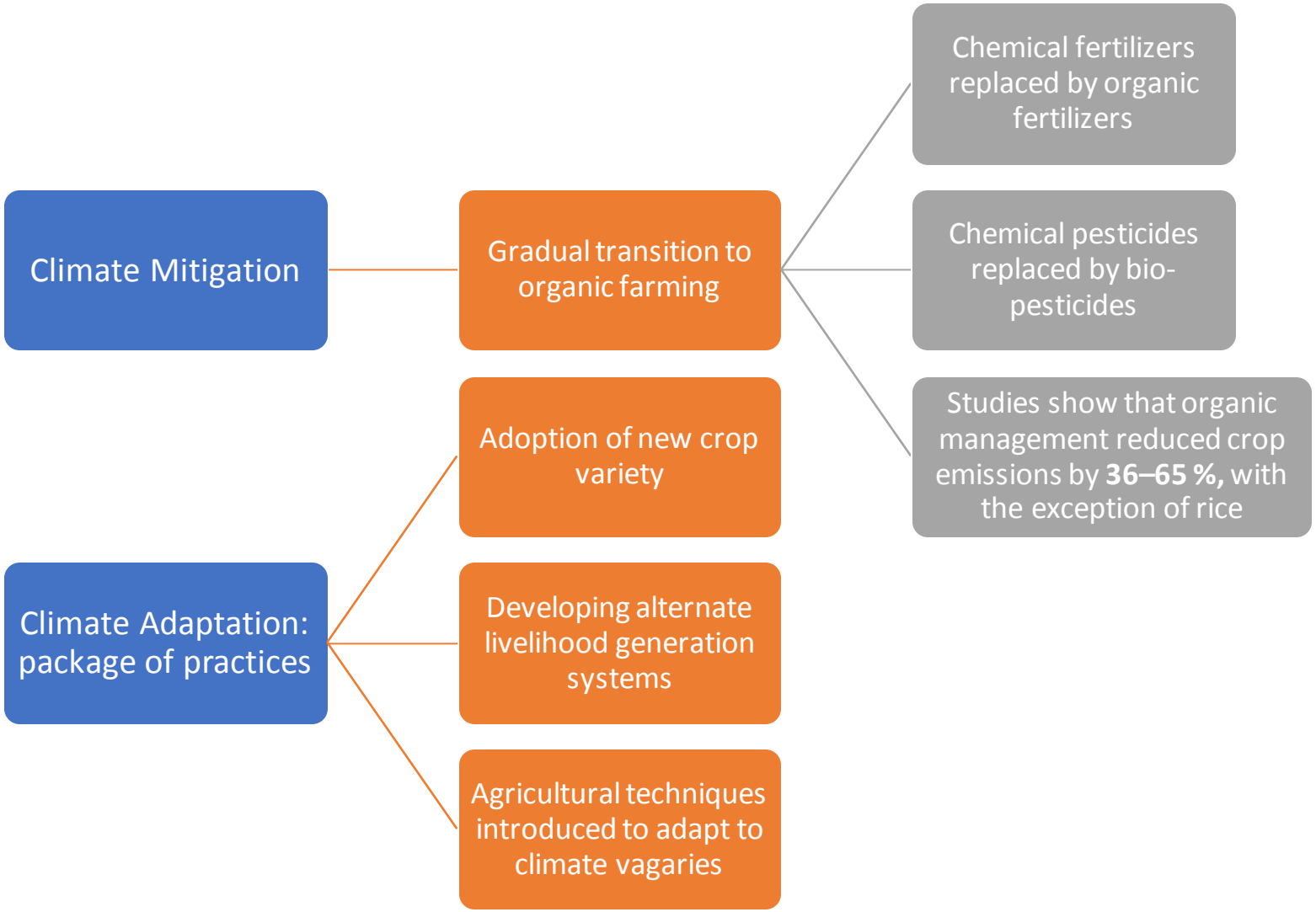
Two **FPO**s are jointly facilitating the implementation

Market Linkages have already been established

Synthite will procure the turmeric from the 5000 farmers

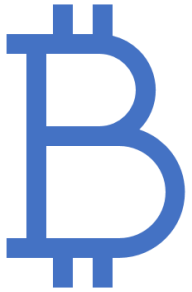
Mahindra Agro will procure the organic vegetables from the 500 women farmers

Climate Resilience



Climate Adaptation

adapting and building resilience to climate change



A new seed variety is being introduced in Nanded – PTS10

It has a higher curcumin content – 20% higher revenue than current variety

PTS10 higher than the Selaum variety to periods of drought and pest attack

PTS 10 – shorter crop cycle

Traditional Selaum variety was harvested in 9 months

The new PTS 10 will be harvested in 7 months

Climate Adaptation – income diversification

sustainably increasing agricultural productivity and incomes

The new PTS 10 variety has reduced the farming period by 2 month

A pilot in progress - 500 women farmers practicing organic farming to grow vegetables

Market linkage with Mahindra Agrotech has also been established to buy the organic vegetables

Organic farming slowly being introduced in Nanded – to aid in transitioning for Turmeric as well

Organic farmers prevent fossil energy emission associated to the industrial production of many inputs and promote soil carbon accumulation.

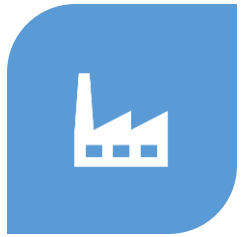
Climate Mitigation

reducing and/or removing greenhouse gas emissions

THE AIM OF NANDIGRAM IS TO MAKE NANDED A ORGANIC DISTRICT FOR TURMERIC

CURRENT PRACTICES PROMOTE FARMERS TO ***SLOWLY TRANSITION*** FROM CHEMICAL PESTICIDE TO NATURAL BIO PESTICIDES

BIO PESTICIDES TO BE PRODUCED BY FARMER PRODUCER ORGANIZATIONS



<u>MITIGATION UPSTREAM</u> – EMISSION IN FERTILIZER PRODUCTION, EXTRACTION OF RAW MATERIAL, TRANSPORTATION AVOIDED

OVER THE NEXT 3-4 YEARS, WITH A GUARANTEED BUYBACK, FARMERS HAVE AGREED TO TRANSITION TO COMPLETE ORGANIC FARMING

Climate Adaptation: package of practices

adapting and building resilience to climate change

Climate variability and climate change – increasing temperatures, long periods of drought followed by short periods of torrential rains have been observed in Maharastra.

Mulching - affordable, sustainable agricultural technology for sustainable soil & land management – for reducing soil erosion, lowering of soil and nutrient losses

Mulching is essential for weed control, for moisture conservation and to protect the beds from the beating action of rain

Climate Adaptation – package of practices

adapting and building resilience to climate change

Water harvesting and irrigation:

Small water harvesting ponds can be created at suitable locations to arrest rainwater during monsoon, which can be used during the dry season.

Proper irrigation facilities necessary to keep the crop healthy. Irrigation by drip or sprinkler is the easiest way. Irrigation by flooding and constant flow of water has been discourages as it will leach away nutrients or wash away fertile soil.

Crops