Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

# Overview of ongoing cooperation with India in the renewable energy sector


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# International cooperation in Climate and Energy policy

- BMUB supports India in the **development and implementation of an appropriate climate protection policy** as India is becoming one of the world's major GHG emitters in absolute terms
- As GHG emissions depend predominantly on fossil energy generation and road transport effective action **necessarily comprises an enabling policy for renewable energies and energy efficiency**.
- The **International Climate Initiative (IKI)** of the BMUB is a key element of Germany's climate financing and funding commitments in the framework of the Convention on Biological Diversity
- Priority is given to activities that support creating an international climate protection architecture and demonstrate **innovative and transferable solutions**.
- The IKI cooperates closely with partner countries and supports consensus building for a **comprehensive international climate agreement.**

# International Climate Initiative (IKI)


Mitigation


Adaption


REDD+


Biodiversity

## Two-fold strategy

Links negotiations with concrete actions
(acting and negotiating approach)

Combines concrete on-the-ground activities with conceptual work

Aims to generate momentum for negotiations on UNFCCC and CBD

# Methodological approaches of IKI

- **Policy advice** on incentive-based instruments, such as emissions trading and carbon market mechanisms, feed-in-tariff regulations, net-metering or labels and standards
- **Innovative financing instruments** to mobilize private capital with low interest loans in cooperation with development banks
- Technologically advanced **demonstration projects** for the integration of high shares of renewable energy, in particular solar power, into energy systems
- **Analysis and processing of data** related to renewable energy and energy efficiency
- **Training and capacity building** on the national and sub-national level

# Project examples for IKI projects

# IGEF Support Office – Climate Change Mitigation and Decentralised Power Generation

- **Information on latest policy and technology developments**
  - Sub group meetings
  - Workshops
  - Market potential & feasibility studies
- **Networking opportunities**
  - Meet relevant stakeholders from industry, research organisations and policy makers from Germany and India
- **Support in setting up task forces and cooperation project**
  - Proposals submitted to the Support Office

# RESRA – „Renewable Energy Supply in Rural Areas“

- Create **local economic activity** using sustainably grown plants and innovative genset technology
- Design tailor-made and sustainable solutions for rural energy making use of **locally available biomass**
- Use only biomass from **agricultural waste** and do not include edible vegetable oils
- Develope **business models for energy services** that are made available by the village community (2 pilot projects covering 26 villages)
- **Holistic approach** including sustainable *supply* of biomass for power *generation*, *operation* and *maintenance* of plant and equipment, *distribution* and *use* of power with an appropriate system of *payment*.

# RESRA – „Renewable Energy Supply in Rural Areas“

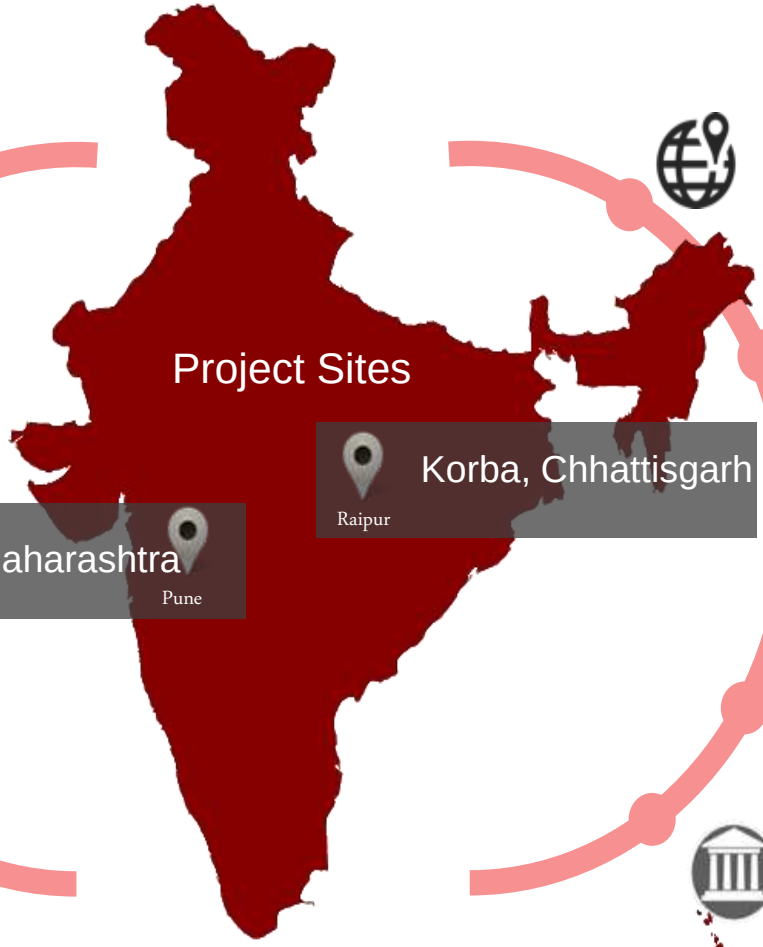
2 villages about 40 km from Pune

Rural community

Livelihood based on modern practices in agriculture, animal husbandry and local industry

Patriarchal society

Project governance through Village Energy Enterprise




24 villages grouped into 6 clusters

Mostly tribal communities

Livelihood based on animal husbandry, hunting and tribal farming

Matriarchal society

Project governance through Village Energy Committee

# RESRA: Kolwan – Infrastructure and Activities

Project site – Kolwan village

Napier Grass Plantation

Biogas Digesters – Kolwan village

Silage Experiment – Nanegaon village

# RESRA: Kolwan – Dry-digestion Biogas Plant

- Based on Napier Grass as feedstock
- (15 tonnes every alternate day at 20% Dry Matter) generates 400 m3 /day
- Number of Customers : 2 (under pilot project)
  - Zilla Parishad School (Mid day meal of 500 children cooked by Self-Help Group)
  - A household of 18 members in the family
- Biogas pipeline of 550m laid
- Biogas pipeline planned by Ministry of New and Renewable Energy (MNRE) India

# RESRA: Korba – Infrastructure and Productive Applications

Storage & equipment sheds

Electricity supply Grid in 10 villages

SVO Gensets operations

Rice Huller (Productive Use)

Ready to Eat (Productive use)

Drip Irrigation based Farming

# RESRA: Korba - Straight Vegetable Oil (SVO) Gensets

**Feedstock : Oil from locally procured Jatropha seeds**

- Capacity : 7.5/10/20 kW sizes across 24 villages
- 3-phase electricity
- Simple push button technology
- Grid lines have been laid up to 1 kilometers
- Oil expellers and filtration systems for fuel manufacturing
- Trained operators from the community for operations and minimal maintenance

# TRIGEN – Reduction of GHG by energy efficient cooling

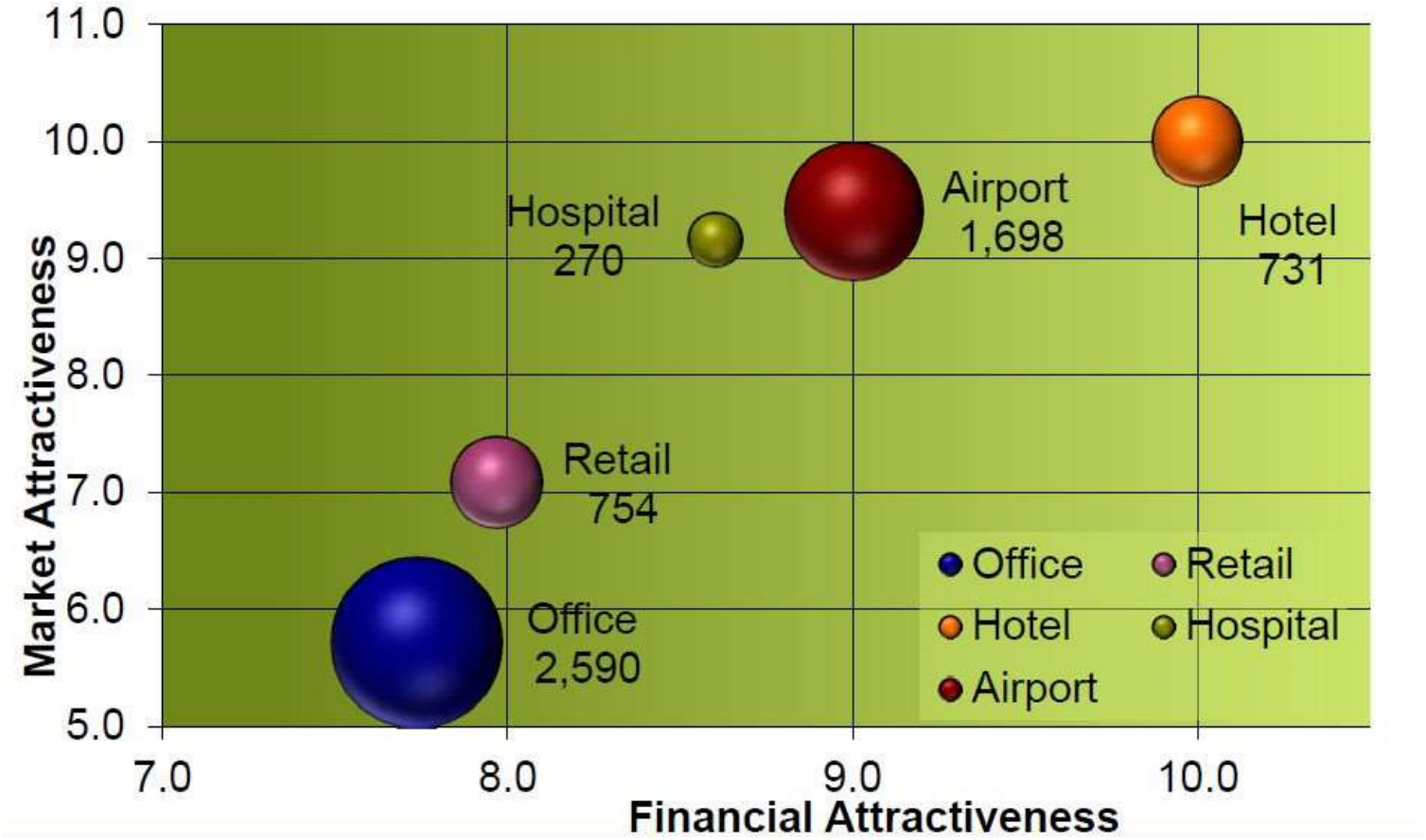
- Explore innovative **cooling technology using waste heat** and driving down greenhouse gas emissions through the deployment of **trigeneration systems (CCHP)**.
- Demonstrate the **technical and economic viability** of trigeneration technology to potential users by means of a **pilot plant**
- Provide interested potential users via a website with **information about the technology and suppliers**
- Evaluate further potential sites and inform suppliers about **market opportunities**
- Develop an action plan to help create an **enabling environment for trigeneration technology**

# TRIGEN - Case Study: CCHP/Trigeneration

**Jai Prakash Narayan Apex Trauma Center, New Delhi, India**

- Emergency/Trauma care hospital
- Four emergency grid supplies in case of power failures
- Diesel generators: 3 * 1 MW (emergencies)
- Peak energy demand: 1.5 MW (peak summer)
- Peak cooling load: 800 TR
- Heating demand in kitchen, laundry, sterilization, etc.

# TRIGEN – Promising market segments in India



# SOLMAP - Solar Mapping and Monitoring

- Provide reliable data on solar irradiation and monitor the efficiency of solar plants currently in operation
- Establish country-wide framework for the collection of solar and other relevant weather data (preparation of solar maps)
- Develop and test a system for performance monitoring of solar electric power plants (Benchmarking)
- Networking & Capacity Building of the partner institution (NIWE)

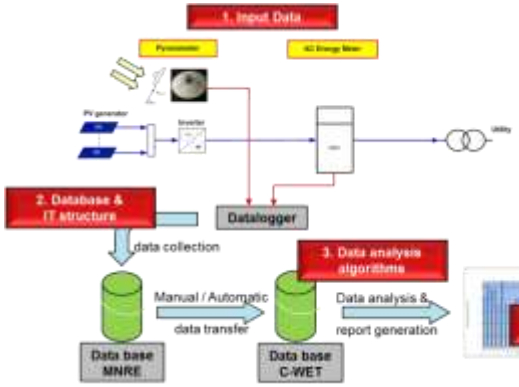

# SOLMAP – Achieved results

- Solar radiation measuring stations successfully set up by NIWE at **121 locations** in India with active support of GIZ (**world‘s largest pyrheliometric mesurement network**)
- Sophisticated procedures for **data quality contro**l and its dissemination implemented. Quality controlled time series data streams for the monitoring stations generated.
- “**Solar data sharing and accessibility Policy**“ (2013) of MNRE introduced and 54 organizations procured SRRA data till end of 2014: 227 times stations’ data procured
- A procedure for undertaking **PV performance benchmarking** developed. Further testing concluded with samples of monitored data streams from 119 PV plants provided by MNRE
- **Calibration laboratory** for solar radiation sensors built and made operational in 2 locations




# SOLMAP – Further results

- Four **typical meteorological years (TMY)** have been constructed by combining data gained from the SRRA **with satellite-based models**
- Work is going on for preparing **solar atlas of India** with the help of satellite based modelling combining ground measurement data. It will be launched in May 2015
- Efforts are being made for **PV benchmarking exercise** to build up a complete package for MNRE
- **Special investigations** are being carried out on (1) influence of soiling on radiation sensors, (2) advanced gap filling methods for radiation data, (3) concept for CSP benchmarking




# COMSOLAR - Commercialization of Solar Energy in Urban and Industrial Areas

- Develop and demonstrate innovative **business models** of for the commercialization of solar energy in both urban and industrial zones
- Develop a **strategy for marketing** solar energy and **supporting the implementation** of the National Solar Mission
- Implement **multi-level activities** including *feasibility studies*, *technology transfer*, *information campaigns* and *comprehensive capacity building* for the project partners
- Support the implementation of **selected pilot projects** in various technological areas.

# COMSOLAR - Multi-pronged strategy approach

Multi-Pronged Approach

## DEMO PROJECTS

- Rooftop PV
- CSP Dish power plant with storage
- Solar Air heating

## POLICY ADVISORY

- National bodies
- Selected States
- Studies


## CAPACITY BUILDING

- Trainings and workshops
- Web based tools (www.SolarGuidelines.in)
- Sector campaigns (www.soproindia.in)

# COMSOLAR – Solar rooftop projects in urban transport

- Huge potential of rooftop PV with Metro Rail systems in India
- GIZ is providing economical and technical advisory and active support to Delhi Metro
- The first project 500 kW is installed with replication of 20 MW on other DMRC buildings in Delhi
- First large scale rooftop PV plant on RESCO business model
- GIZ is receiving similar support requests from other rail corporations




**Note:** Delhi Metro is one of the large metro rail systems in the world with a total length of 193 km and serving through 140 stations

# COMSOLAR – 1 $MW_{el}$ (3.5 $MW_{th}$) Solar Thermal Power Plant

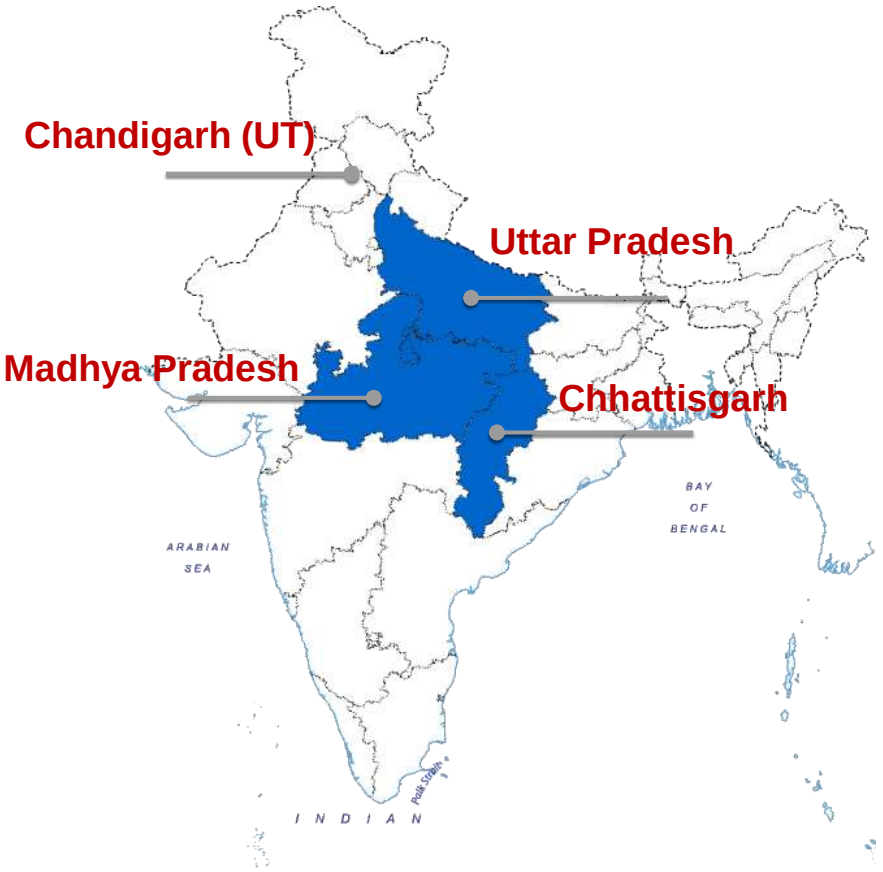
- 1 $MW_{el}$ innovative solar plant using 770 60 $m^2$ Scheffler Concentrating dish and 16 hour thermal storage technology – designed for 24 x 7 operation
- IndiaOne Project is implemented in the middle of mountains in Mount Abu, Rajasthan
- Internationally renowned experts including Fraunhofer ISE, Dr. Scheffler are research partners
- Strategy to reduce cost, scale-up will be developed along with industry partnerships

# COMSOLAR – Low Cost Solar Air heating systems (SolLad)

- Implementation of a solar air heating system for high altitude region Ladakh, Himalaya
- Economic, environment and health friendly heating solution for region with >7 month sub zero temperatures.
- Simple and economic technology with opportunities for local manufacturing
- Low maintenance, frost-proof operation, as heat transfer medium is air
- First 2 demonstration systems implemented and under monitoring

# COMSOLAR – Policy Advisory to MNRE & States

- Support to MNRE & 4 nodal agencies for development of implementation framework* for rooftop PV projects
- Tender on 5 MW rooftop PV projects on government buildings in 3 cities in Madhya Pradesh developed through GIZ
- Recommendations to Uttar Pradesh are taking shape in the form of policy design for rooftop PV; Next phase involves implementation support for 7 MW pilot projects on government buildings
- More than five states have released net metering guidelines referring FOR's guidelines




*Framework includes contractual document preparation such as RFS, PPA, Lease agreement, Net metering agreement etc.

# COMSOLAR – Success Indicators

- ~28 MW of commercially viable rooftop solar PV committed within project activities
- Direct commitments of > € 36 Mio* by Indian public and private sector – additional to project budget
- More than 10 states have policies and regulatory framework for promotion of rooftop solar photovoltaic projects
- PV solar rooftop now is a topic of public interest – e.g. discussions about GOI backed loan programs
- Solar thermal technologies & solutions for e.g. industrial process heat, air heating, thermal storage being developed, introduced & promoted

*exchange rate 1 Euro / 80 INR

# I-RE – Integration of Renewable Energies into the Indian Electricity System

- Effectively supports MNRE to promote the **climate-friendly development of the Indian power market** and increase the proportion of energy from renewable sources
- Technically supports in **model-based and holistic analysis and planning** of Indian energy system  with high shares of renewables
- Helps designing **regulatory framework** and **funding mechanisms** to encourage broader use of decentralised photovoltaic systems on building rooftops
- Enhances the expertise of the Ministry employees by **studies and training** to create an enabling technical and financial policy framework for renewables
- Contributes to the formulation of a **nationally appropriate mitigation action** (NAMA) under the scope of the project

# Summary: Successful on-the-ground activities funded by BMUB

- We have established a **deep-rooted and reliable partnership** with the Indian government and local stakeholders involved in RE development (IGEF-SO)
- We have demonstrated paths to **local economic activity** in rural India using energy generated from locally available renewable resources (RESRA)
- We have demonstrated the potential of **CCHP technology** in India combining reliable onsite generation with very high conversion efficiencies (TRIGEN)
- We have built up a reliable **solar resource assessment framework** to facilitate evaluation and financing of solar power plants in India (SOLMAP)
- We have build up a project track record to **showcase the implementation of solar power** in public infrastructures and commercial/industrial facilities (COMSOLAR)
- We have started a new initiative to **boost decentralised (rooftop) PV applications** and incentivize the necessary investments by a re-design of regulatory systems (I-RE)

# Thank you
# for your attention!