

# Bulk Renewable Generation: The Path to Rigorous Sustainable Development

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**Workshop on**  
**“Scaling up the Use of Renewable Energy in Rural Areas in DCs”**  
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# Overview

- ❑ Water, Energy, & Food Security in DCs (SEI, Bonn2011)
- ❑ Status Quo of the Energy Supply Model
- ❑ Recommendations
- ❑ The Way Forward
- ❑ Deployment of RETs in Rural Areas: Opportunities & Challenges





## Water, Energy, & Food Security in DCs

- ❑ The “Bottom Billion” lives with no secure food supply, and limited access to clean water, sanitation or modern energy services;
- ❑ Over-exploitation of natural resources in DCs! by the developed world have seriously downgraded many terrestrial and aquatic ecosystems.
- ❑ “Rapidly Increasing Demand for Development and Climate Changes Issues are intensifying pressure on natural resources and hence adding to the vulnerability of poor people and their ecosystems!



## Water, Energy, & Food Security in DCs

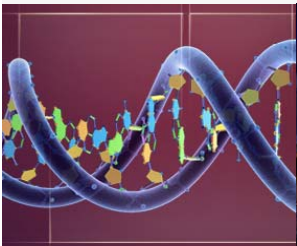
- ❑ **Urbanization** is inviting more slum dwellers to embrace more resource intensive lifestyles that simply lead to unsustainable consumption patterns and waste production;
- ❑ **No clear global plans to reconciliation: Climate protection and equity goals to secure non-negotiable human rights to water, food, and energy;**
- ❑ **Bad governance** with institutions that lack required capacities, change agents, and serious political will - IRENA!





## Water, Energy, & Food Security in DCs

- ❑ Move from resource-based economy to Green Economy;
- ❑ GE is an economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities;
- ❑ Approach includes seeking to unite under a single banner the entire suite of economic policies of relevance to sustainable development (another term for Whole System Approach)!
- ❑ The role of **Renewable Energy** is envisioned big in this transition



## Status Quo of Energy Supply in DCs

- Major consumers of gas and petroleum products:
  - **Transport (43%);**
  - Residential (18%);
  - Industry (17%)
- Major consumers of generated electricity:
  - **Residential (56%);**
  - **Industry (26%)**



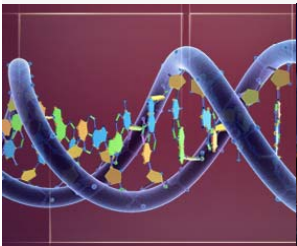


## Status Quo of Energy Supply in DCs

**Access:** 20+ million, mostly in rural areas, have no access to appropriate energy services esp. electricity; further more about 30 million are severely undersupplied.

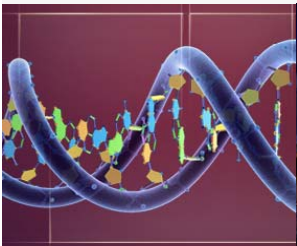
→ 50+ million need to be reconsidered for basic energy services.

**Fossil fuel** is significantly consumed in cities & towns, while its very form of supply to rural areas hinders growth & development (due to **lack of infrastructure**) making it unsustainable both in short & long terms for rural development!



## Status Quo of Energy Supply in DCs

- Breakdown of Sub-Saharan Africa Population:
  - Remote Rural Areas (16%);
  - Rural hinterlands (50%);
  - Periurban Cities (10%);
  - Intermediate Cities (10%);
  - Megacities (14%)
- 76% of our population lives in rural areas! How fair is the **current energy supply model**?





## Recommendations

### IRENA (Energy Ministers):

- Clear and stable policy frameworks to attract investors and private sector;
- Explore opportunities for **local manufacturing**;
- Assess specific technologies at national level and design **roadmaps to tailor RE to local conditions**;
- Include **RE in economic development strategies** and develop **business/entrepreneurship models** for renewables & their productive use.



## Recommendations

### Declaration on a New Era of Global Science

(Budapest WSF2011):

- Improved **dialogue with society** on scientific issues;
- International collaboration in science should be rigorously promoted;
- Collaborative Policies to **overcome knowledge-divides** around the globe;
- **Capacity building for science** needs to be strengthened.





## Recommendations

### David Jacobs; Powering the Green Economy: The FIT Handbook

#### Funding & Deployment of RE

- Use CDM (in theory);
- Create village mini-grids;
- **Establish a national fund**



## The Way Forward (national levels)

- Demand flexibility in the mandates of IRENA to allow the **setup of necessary institutional & Regulatory frameworks**;
- **R&D Setup**: Create a detailed database of all **previous pilot projects** & carry necessary analysis and find out solutions to past problems using **new and innovative technologies** (examples later);
- Implement selected pilot projects (**demo and hands on training**) using an Integrated approach, e.g. **RURAL ZERO-Fossil Fuel Development Roadmap** (later)





## Deployment of RETs in Rural Areas: Opportunities & Challenges

- ❑ Institutional & Technological Barriers (solutions that answer What & How!)
- ❑ Available Opportunities: the limit is the sky depending on your creativity and **level of knowledge**
- ❑ **RURAL ZERO-Fossil Fuel Development Roadmap**



## Institutional Barriers to Deployment of RETs in Rural Areas in DCs

- ❑ Lack of good institutional governance: use of the participatory approach to include all beneficiaries/better civil society involvement;
- ❑ Isolated Effort from different stakeholders including private sector: Formulate partnerships between all stakeholders (private sector, local government, local beneficiaries, financial institutions including banks);
- ❑ Lack/undefined impact of current legal and regulatory frameworks advocated for/ effectiveness of called-for policies (PA for IPP and FITs): Setup and implement pilot projects with different combinations of technologies, policies, and regulatory frameworks (whole system approach);





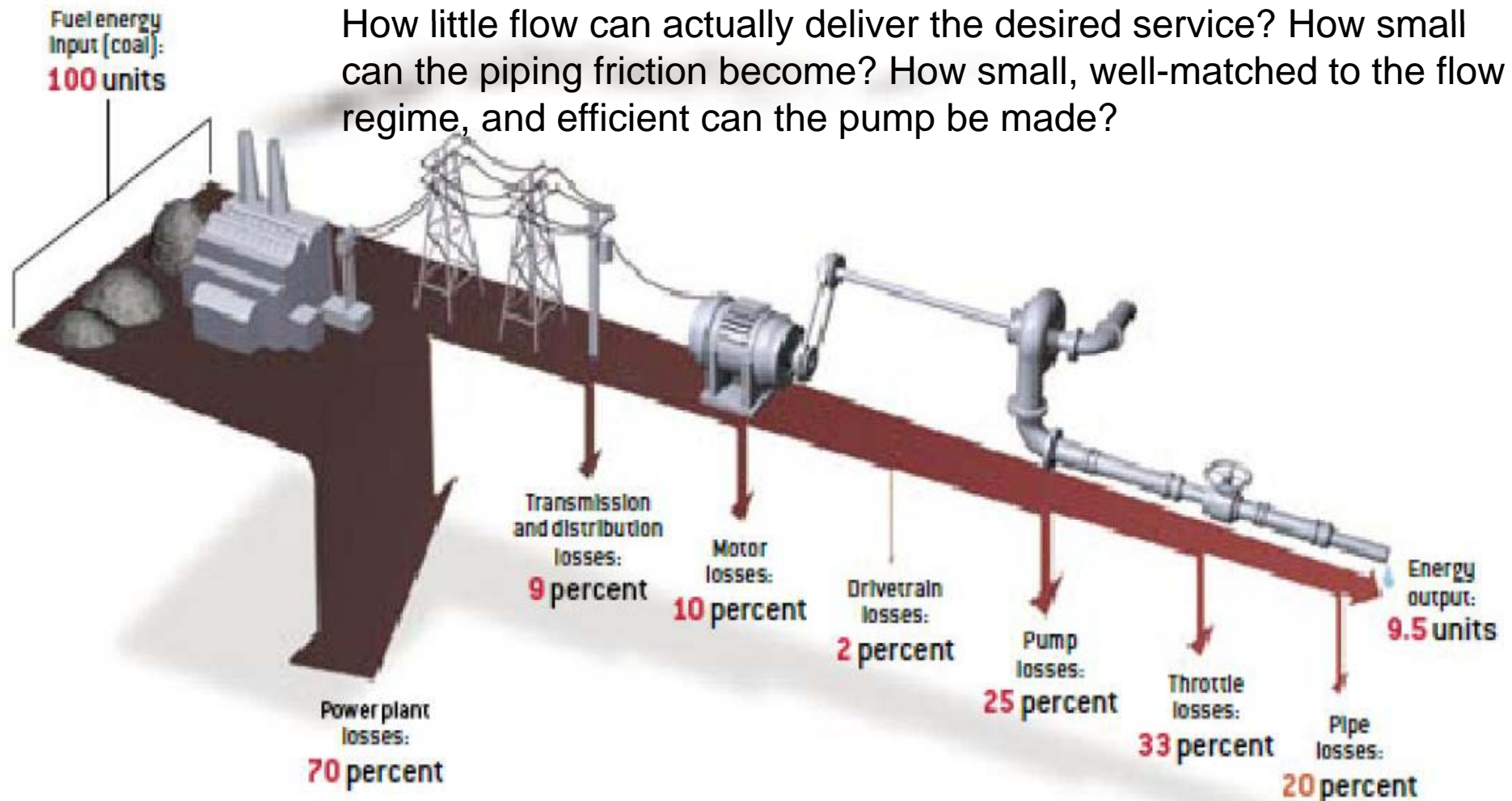


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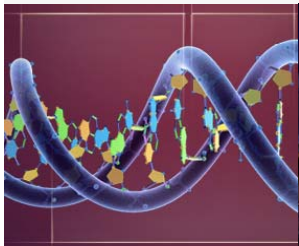
## Whole System Approach

How little flow can actually deliver the desired service? How small can the piping friction become? How small, well-matched to the flow regime, and efficient can the pump be made?



## Institutional Barriers to Deployment of RETs in Rural Areas in DCs

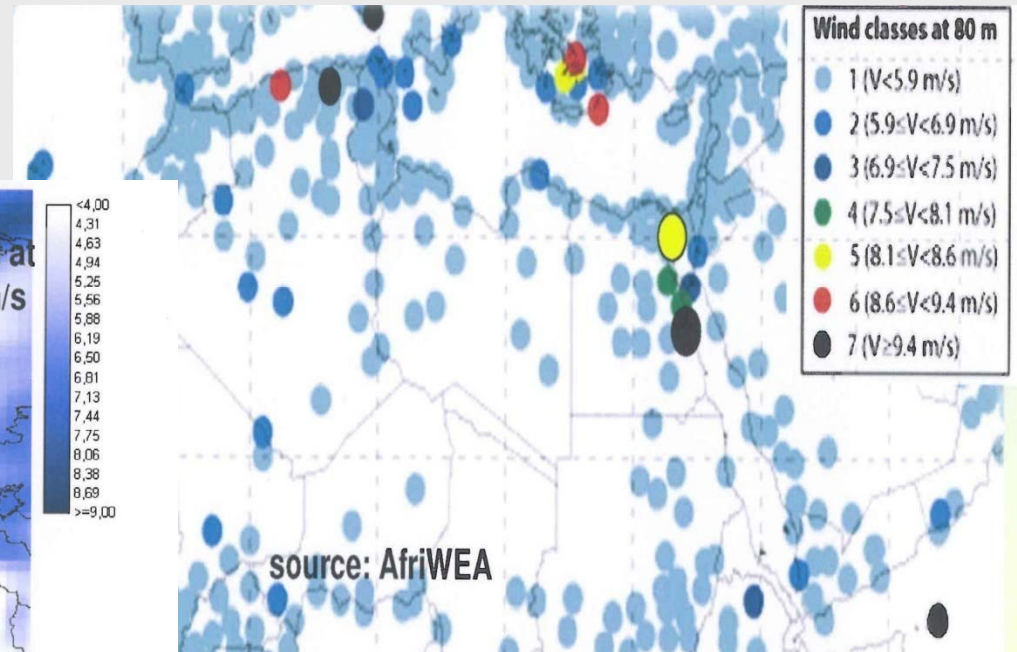
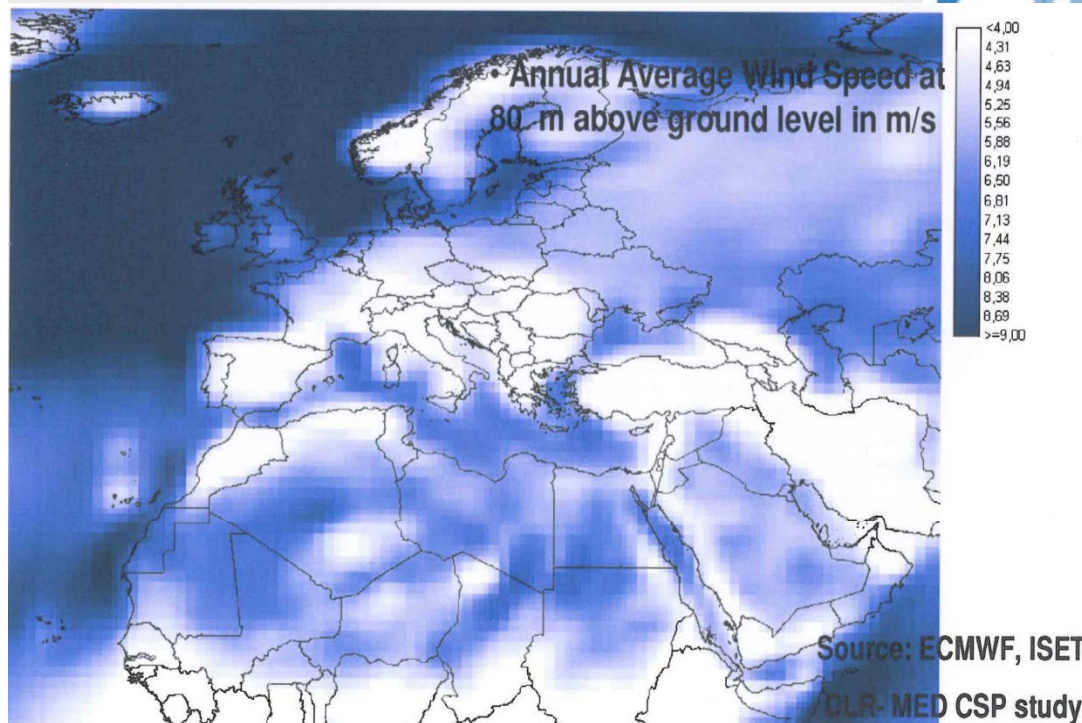
- ❑ Little access to available technologies accompanied by poor industrial infrastructure: **Move to new and innovative technologies where you have an advantage (converging technologies or technologies of the poor: nano and bio) to catch up!**
- ❑ Lack of R&D in science fields relevant to sustainable development: **partnerships between academia, research institutes, and the productive sector (industry) to improve the national innovation system;**
- ❑ Funding & Financing RE projects: **A SERIOUS PROBLEM☺, one important message is: if you are serious, then DO NOT wait for international donors and financial assistance anytime soon!**





## Technological Barriers of:

- ❑ **Wind Energy:** Capacities are geographically specific, and if available it still becomes a problem if the generation and/or demand centre is not close to the grid;





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# Technological Barriers of: Solar Energy



**Solar use**

direct radiation

direct and diffuse radiation

**Size**

10 MW ... 250MW

1 W .. 10 MW

**Installation**

flat rural land

everywhere

**Capacity**

2000 – 7000 h/year (storage)

700 - 2000 h/year

**Back up**

internal, fuel (gas, bio mass)

grid (external)

**Life time**

> 20 years

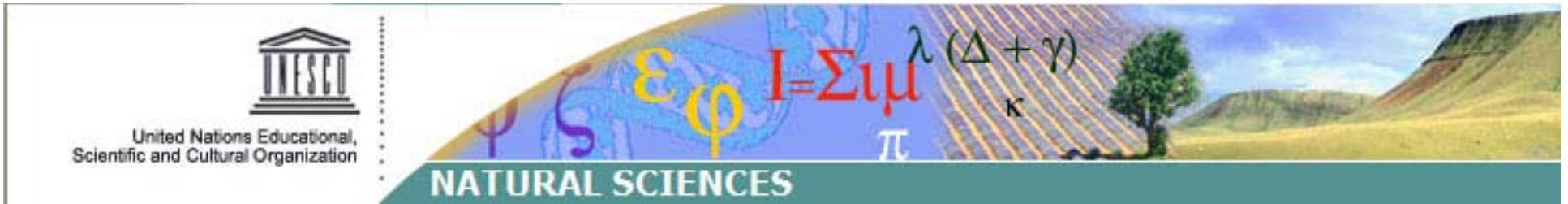
> 20 years

**Generation cost  
(today)**

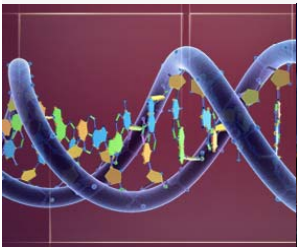
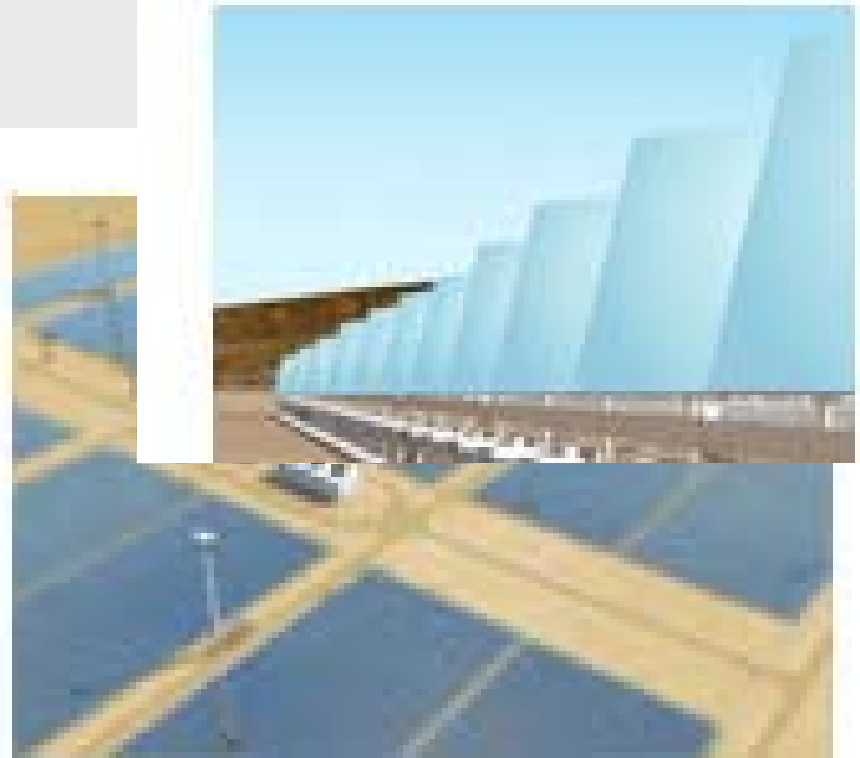
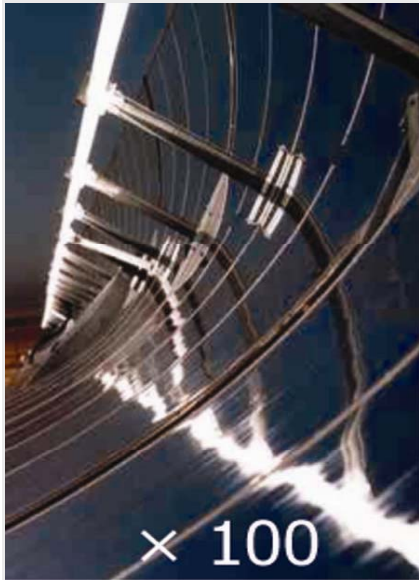
0.15 .. 0.25 €/kWh

0.25 .. 0.50 €/kWh



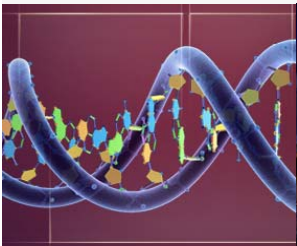


## Technological Barriers of: Solar Energy



## Opportunities to Deployment of RETs in Rural Areas

- ☐ Many previous projects in Europe and USA have proved successful with old technologies. An opportunity avails itself to study, analyze and induce technological changes made possible today;
- ☐ All science fields and engineering applications could be seriously improved using nano-technology (cheap solutions). Start a serious RD&D program to become pioneers in these fields;
- ☐ Pilot and demo projects will induce practical interest in establishing industry alliances with each successful experience;
- ☐ Increasing energy end-use efficiency is generally the largest, least expensive, most benign, most quickly deployable, least visible, least understood, and most neglected way to provide energy services.
- ☐ The un-captured “efficiency resource” is becoming bigger and cheaper in some instances than finding new oil reserves. This potential is also mounting as designers realize that whole-system design integration can often make very large (one- or two-order-of-magnitude) energy savings, as well as reduces the RE system that is required to supply the required energy.





## RURAL ZERO-Fossil Fuel Development Roadmap

**REVERSE Urbanization**

Proper TT models to **overcome knowledge-divides**

**non-negotiable human rights to water,  
food, and energy are preserved**

**Tackle Bad governance**      Early school curricula for **Capacity building for science**

**Research energy for Transport (43% of fossil fuel)**

**Improve Electricity Consumption in  
Residential (56%) and Industry (26%)**

**Address lack of infrastructure in Rural areas**

**Change the current energy supply model**

**Setup the required alliances for local manufacturing**

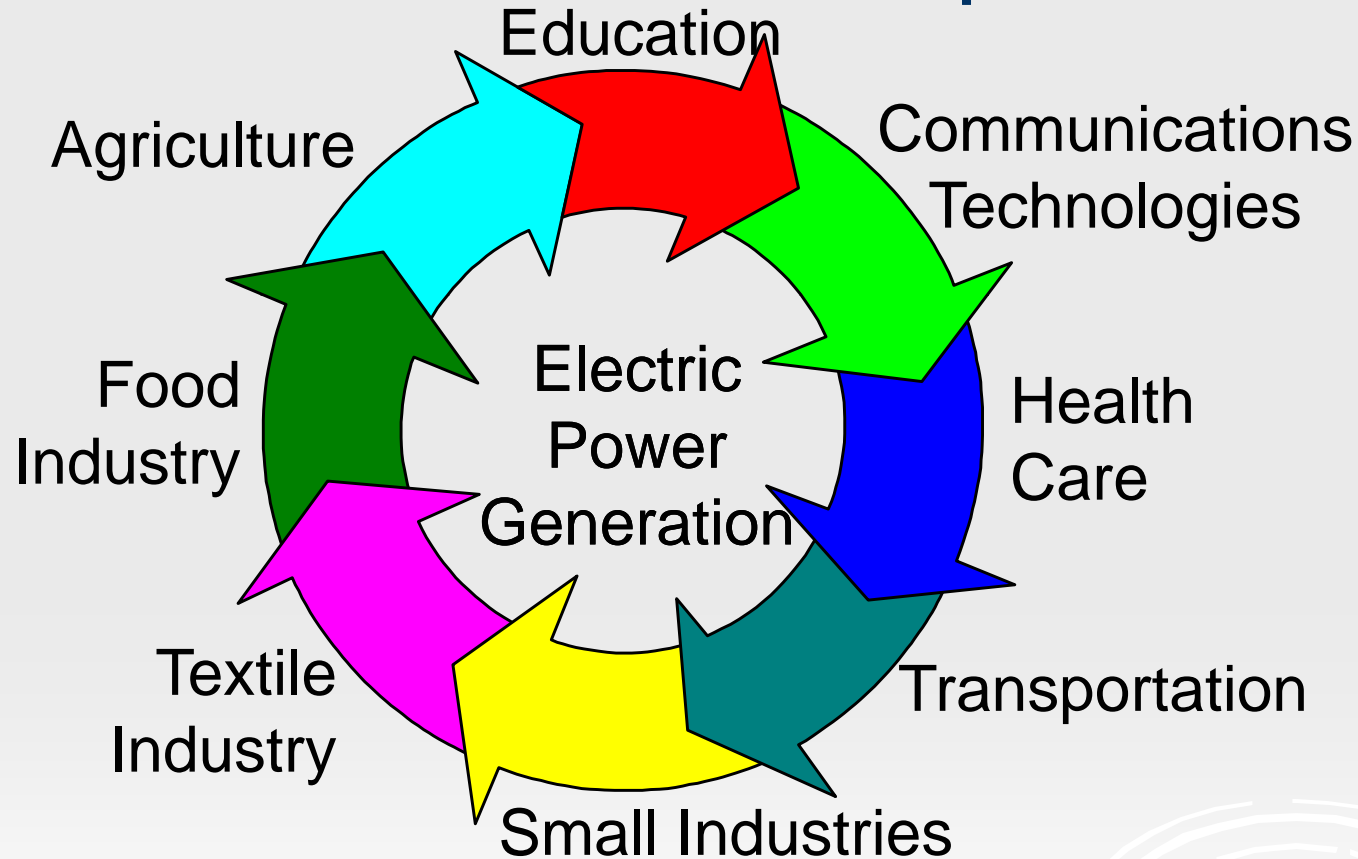
**Regulatory framework to include RE in economic development strategies**

**Promote innovation thru' business/entrepreneurship models**

**Use participatory approach to ensure dialogue with society**

**Cooperative model to establish a national fund through A Clean Fund Act**

## RURAL ZERO-Fossil Fuel Development Roadmap



Rural energy supplies should be scaled well to meet required local development conditions & growth mandates (different options). Rural Planning for required Infrastructure!



😊THANK YOU😊

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