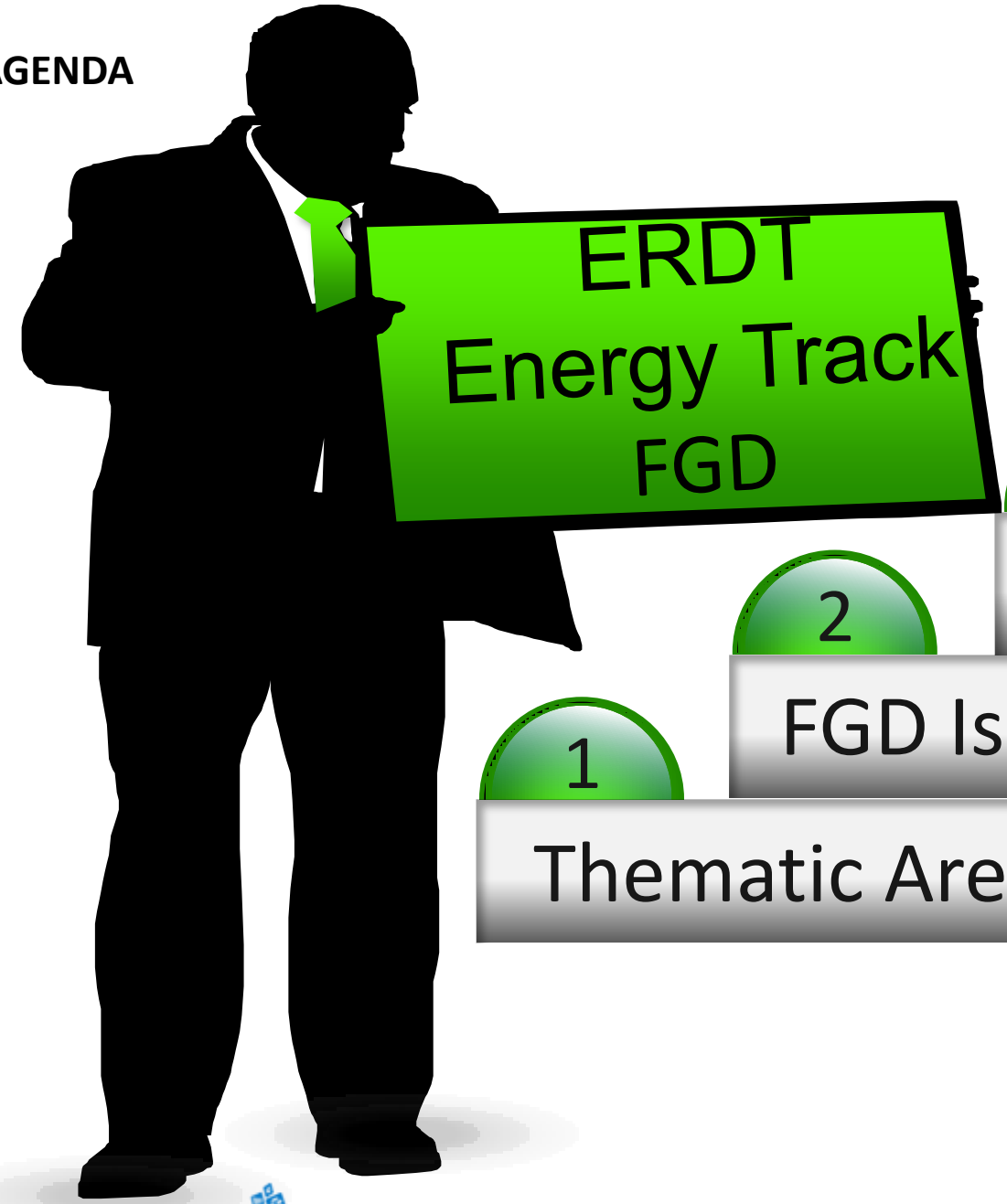
AGENDA



1. Thematic Areas
2. FGD Issues
3. R&D Areas
4. Funding Agencies

Energy FGD Objectives

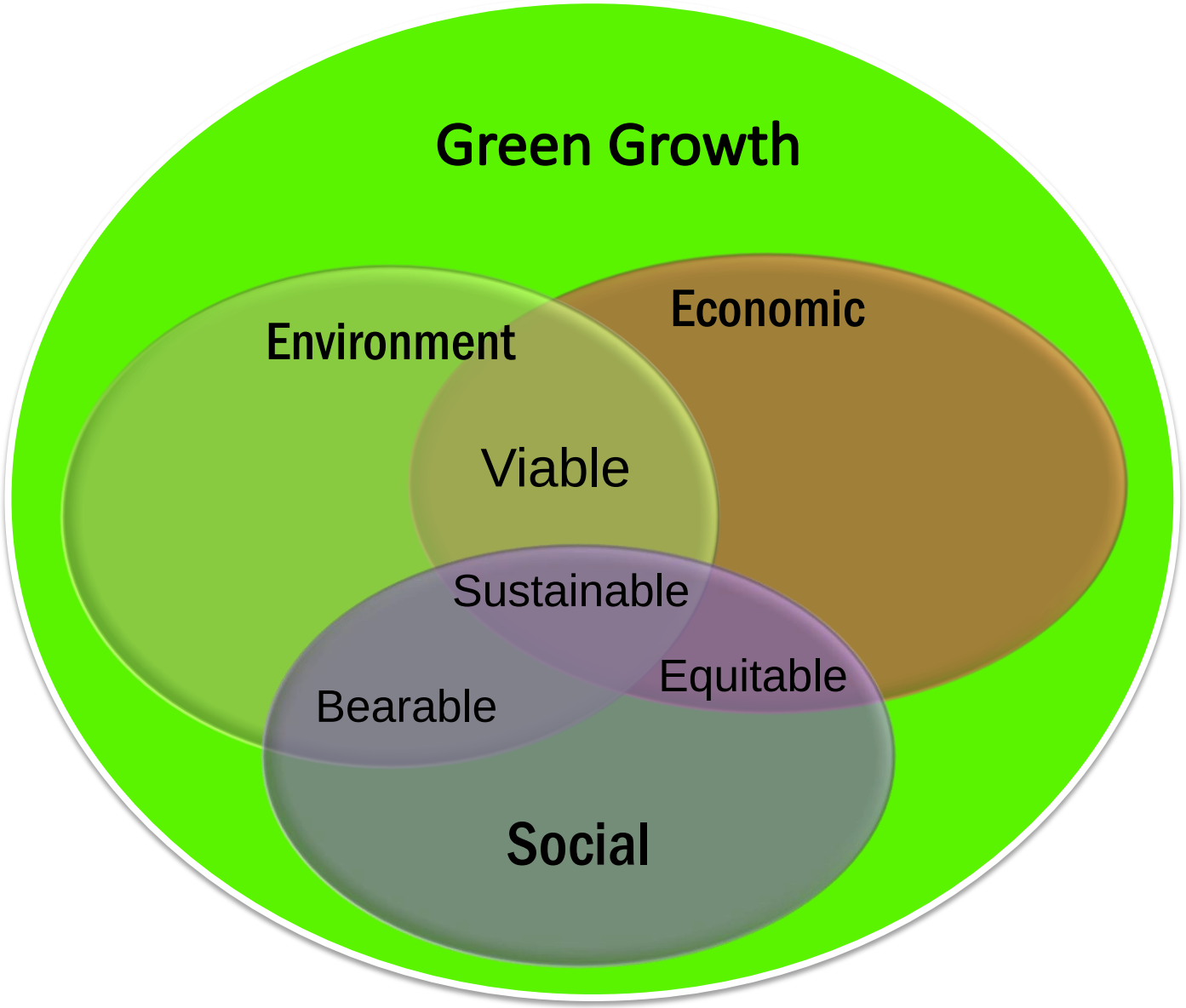
Focus Group Discussions objectives are:

1) Where we are: To conduct on the ground discussions to learn about the plans, policies, & regulations and different studies

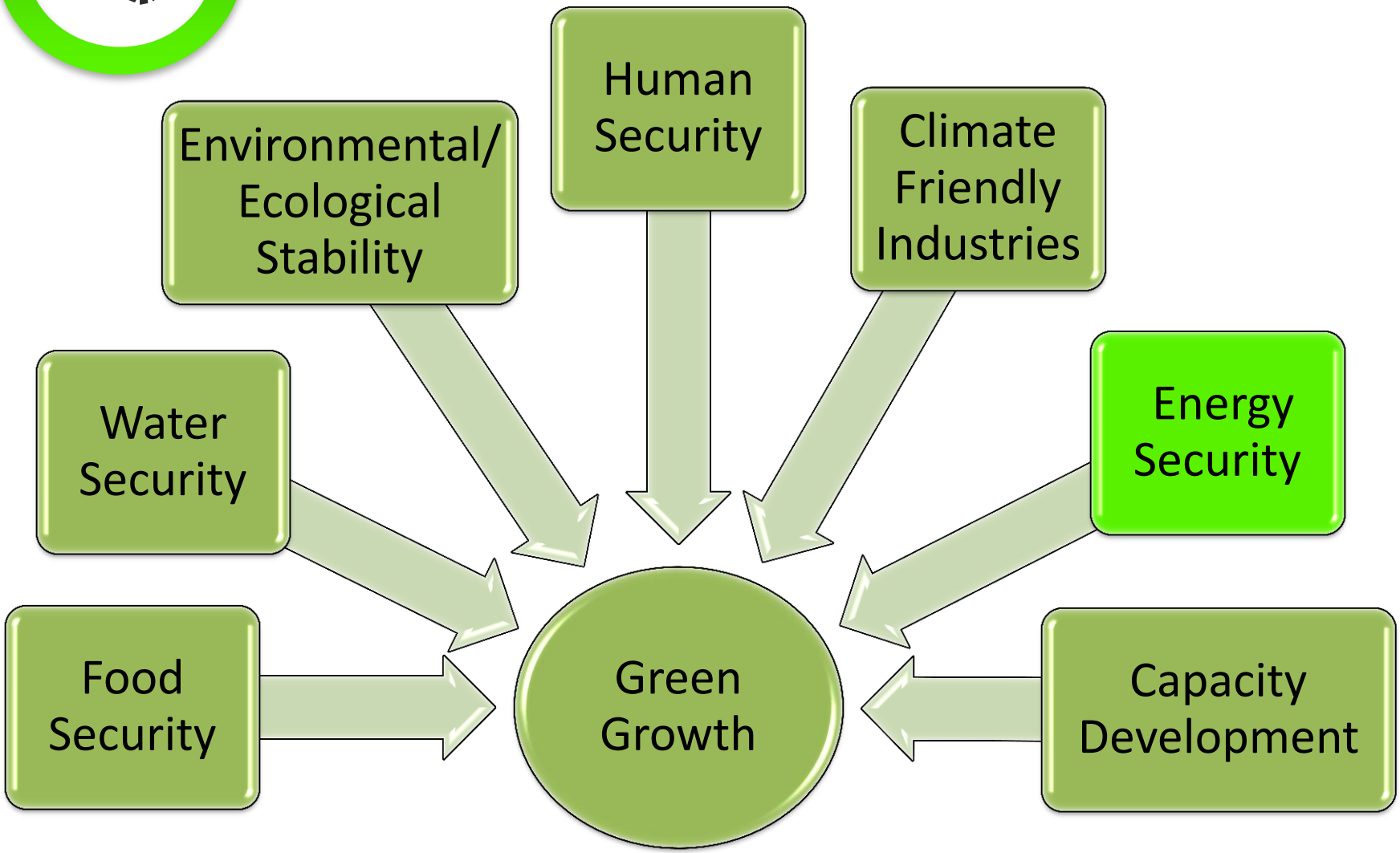
2) What to do: To develop a road map for energy, starting where we are to where we want to be after 5, 10, or 15 years for technology research, development, and adaptation.

3) How to get there: To undertake assessment of resources, training, capacity building, modeling, adaptation, development of integrative solutions towards Green Growth

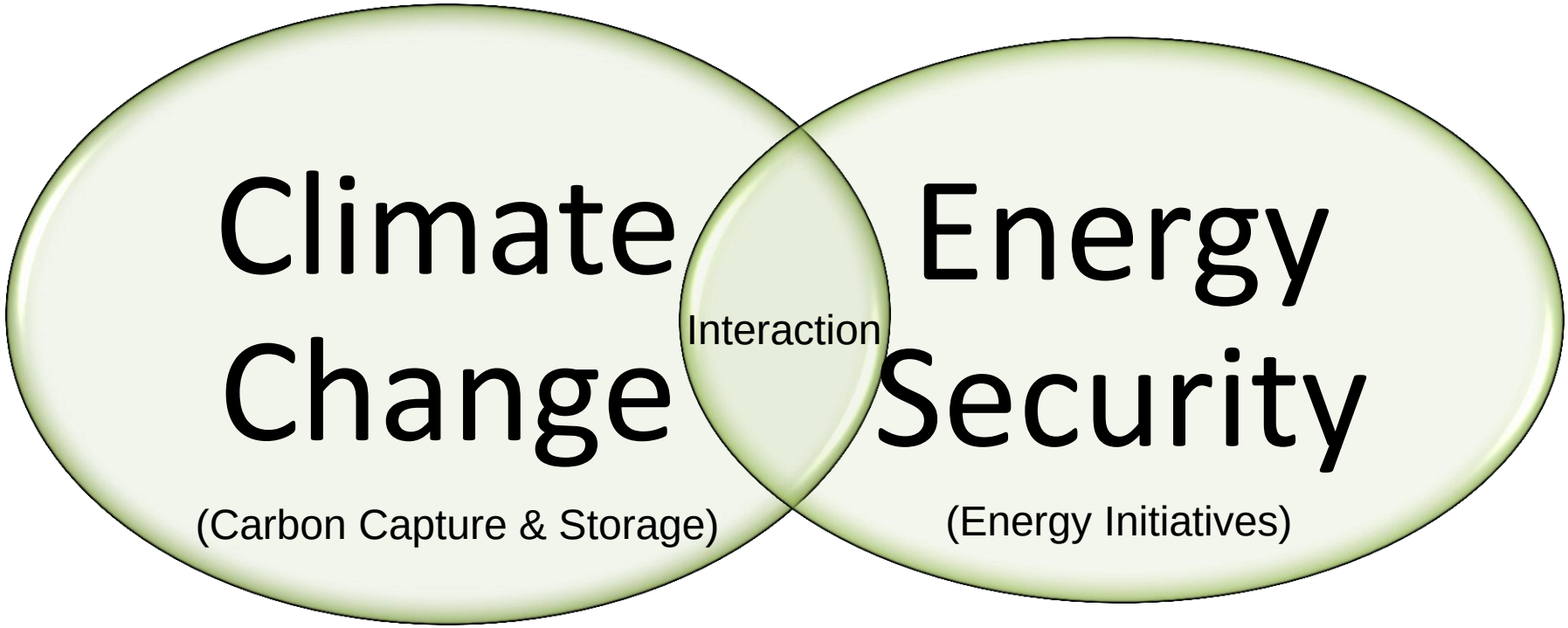
Towards Green Growth



Green Growth: Thematic Areas



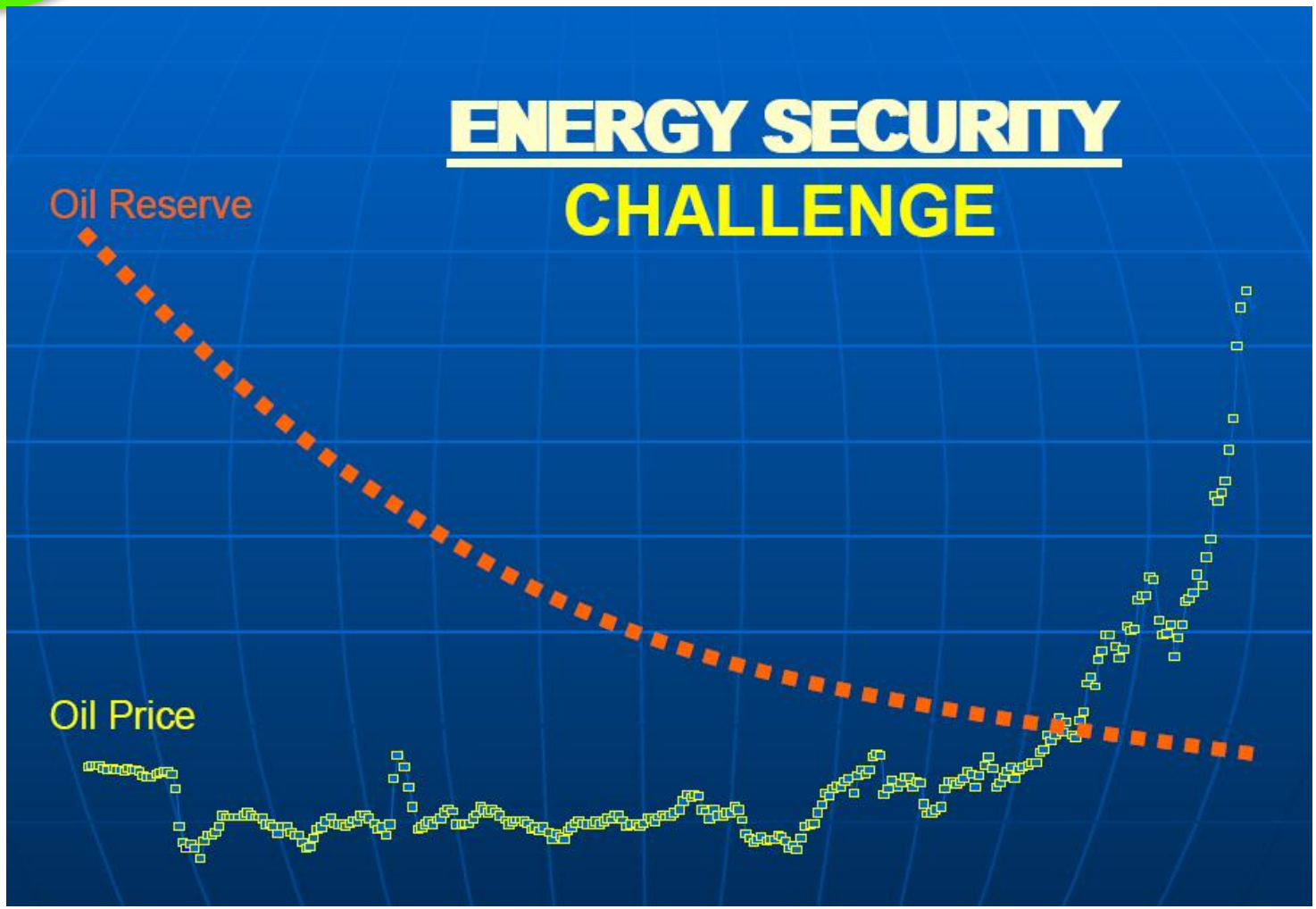
Today's Energy Challenge



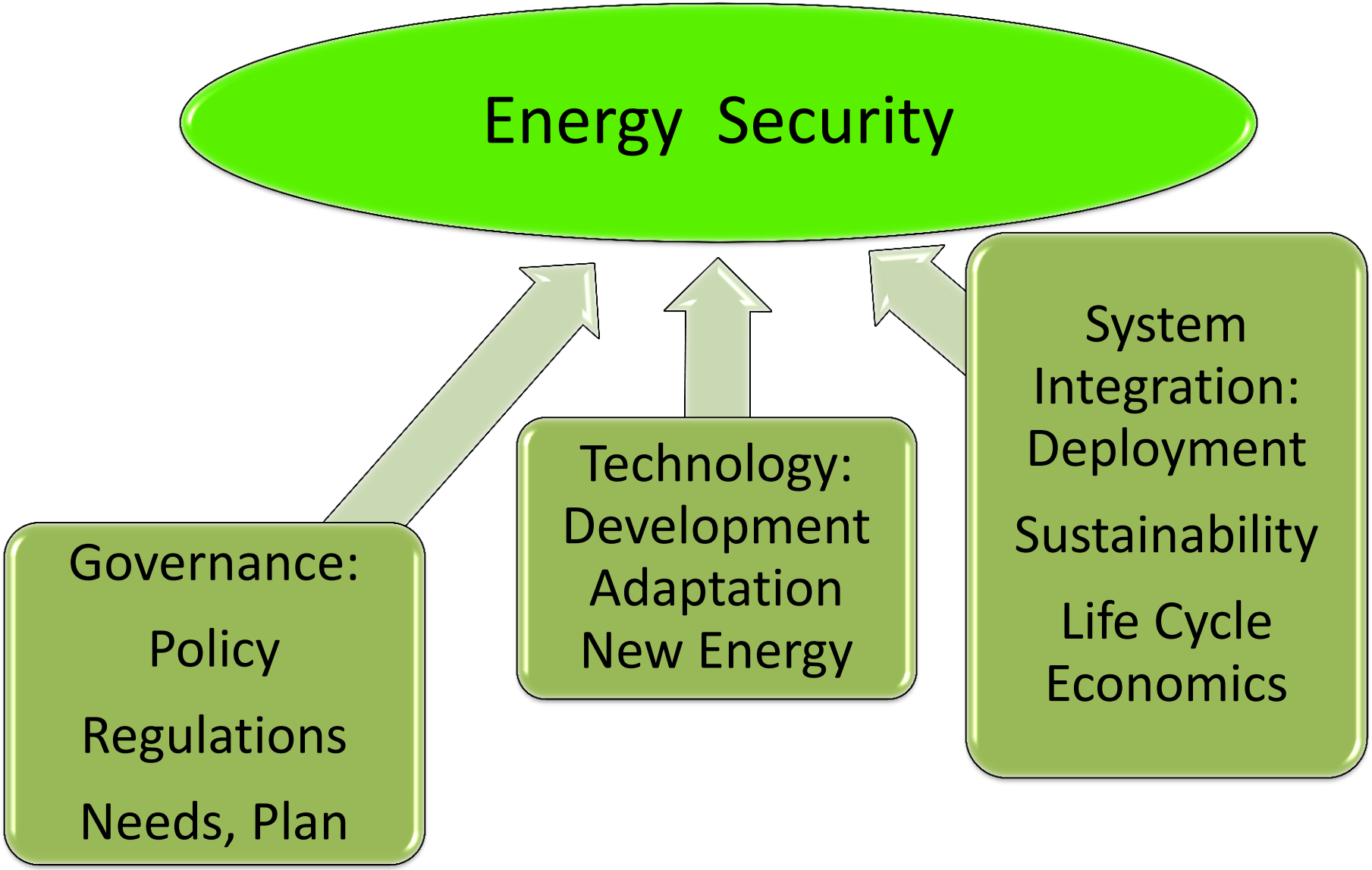
Interaction: 3 Critical Challenges

1. How to spread the benefits of access to energy
2. How to contend with the eventual exhaustion of non-renewable energy resources environment
3. How to prevent climate change caused (part in large) by the increasing concentration of CO_2 in the atmosphere

Time out: Running out of Oil



Road Map


Energy Security
Governance:
Policy
Regulations
Needs, Plan
Technology:
Development
Adaptation
New Energy
System
Integration:
Deployment
Sustainability
Life Cycle
Economics

Energy Engineering Framework

Sustainable Development

Climate Change

Energy Resource Availability

Energy Systems Engineering

Stationary Applications

Conventional, Alternative Fuels

Improved Efficiency

Sequester CO2

Renewable Energy

Sun

Wind

Water

Soil

System Tools

Economic Tools

Core Engineering Tools

Motive Applications

Transport Technology

Transport System issues

Biofuel

Hybrid

Electric

Fuel Cell

Other Applications

ENERGY SYSTEMS

Wind Power

Hydro Power

Coal Fired Plant

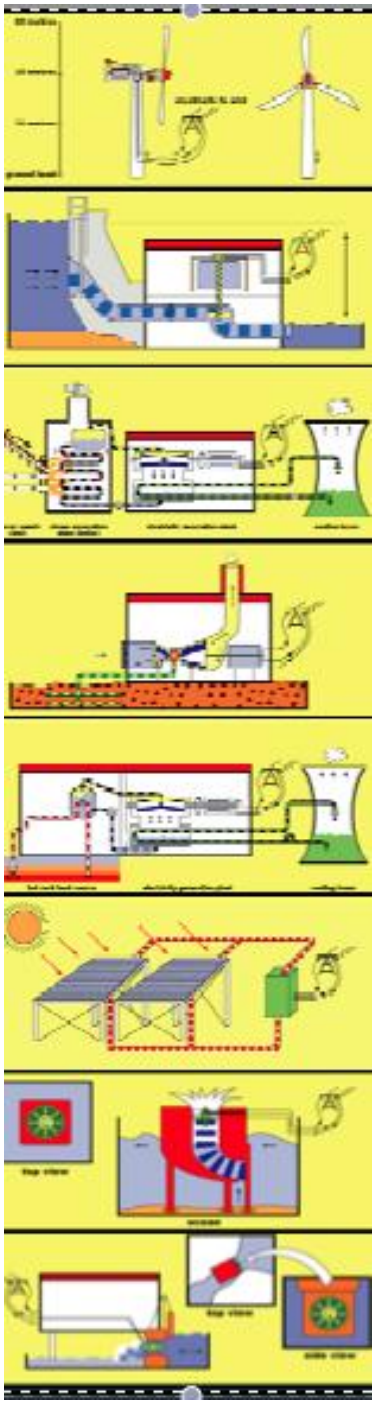
Natural Gas Fired Plant

Geothermal Plant

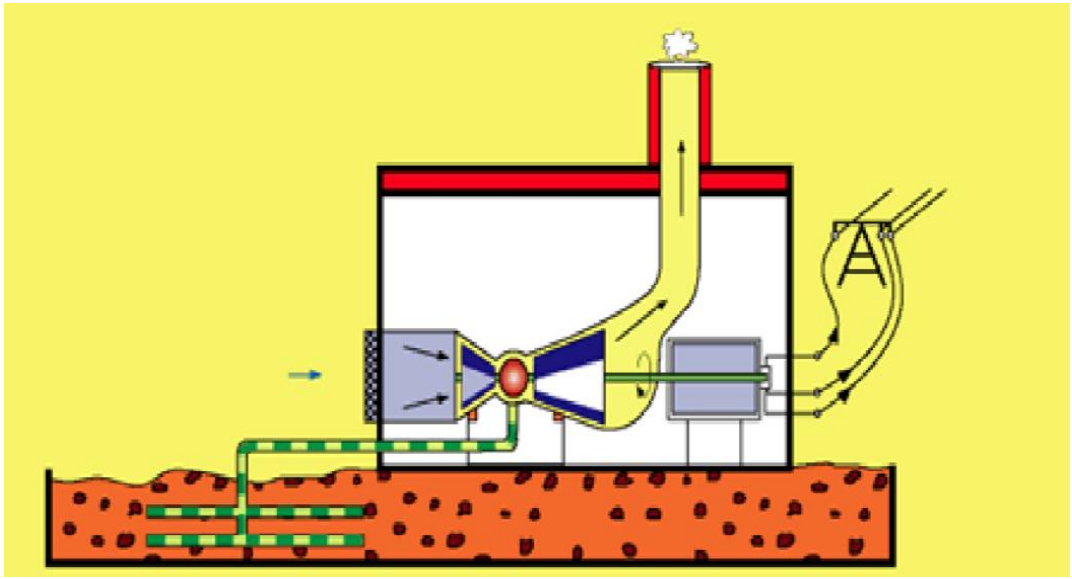
Solar Power

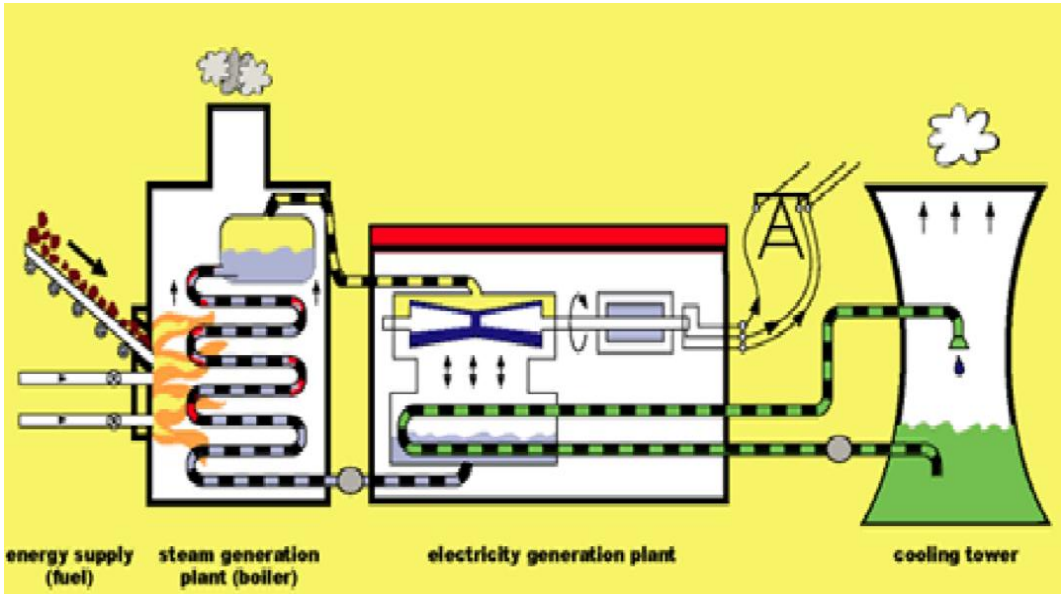
Ocean Wave Power

Ocean Tidal Power

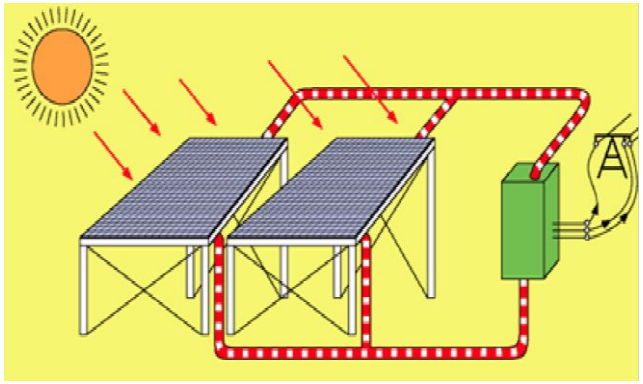


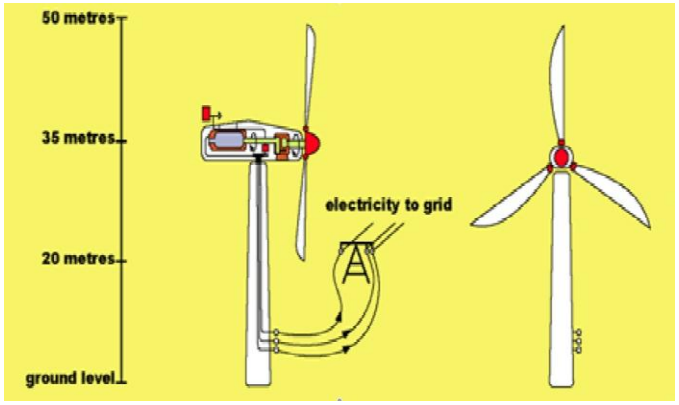
Conventional Energy Systems



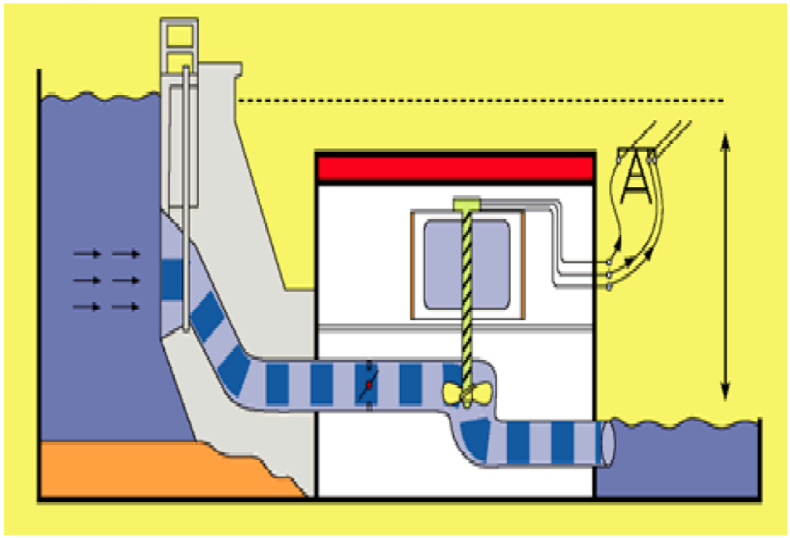


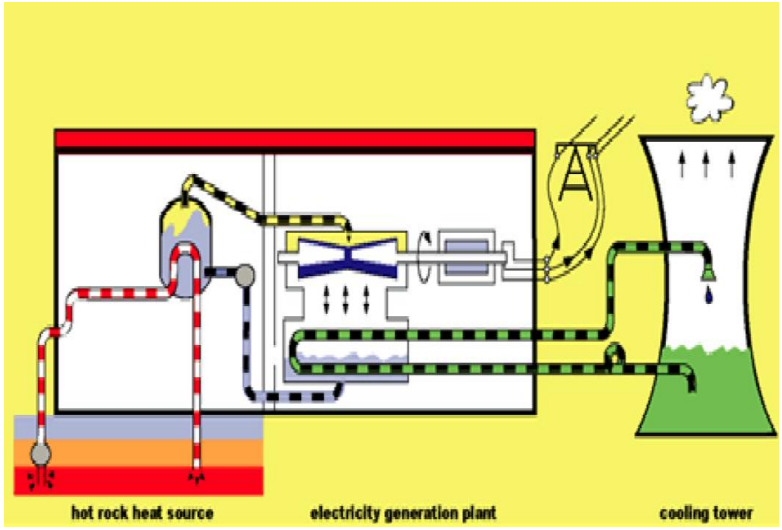
Renewable Energy Systems



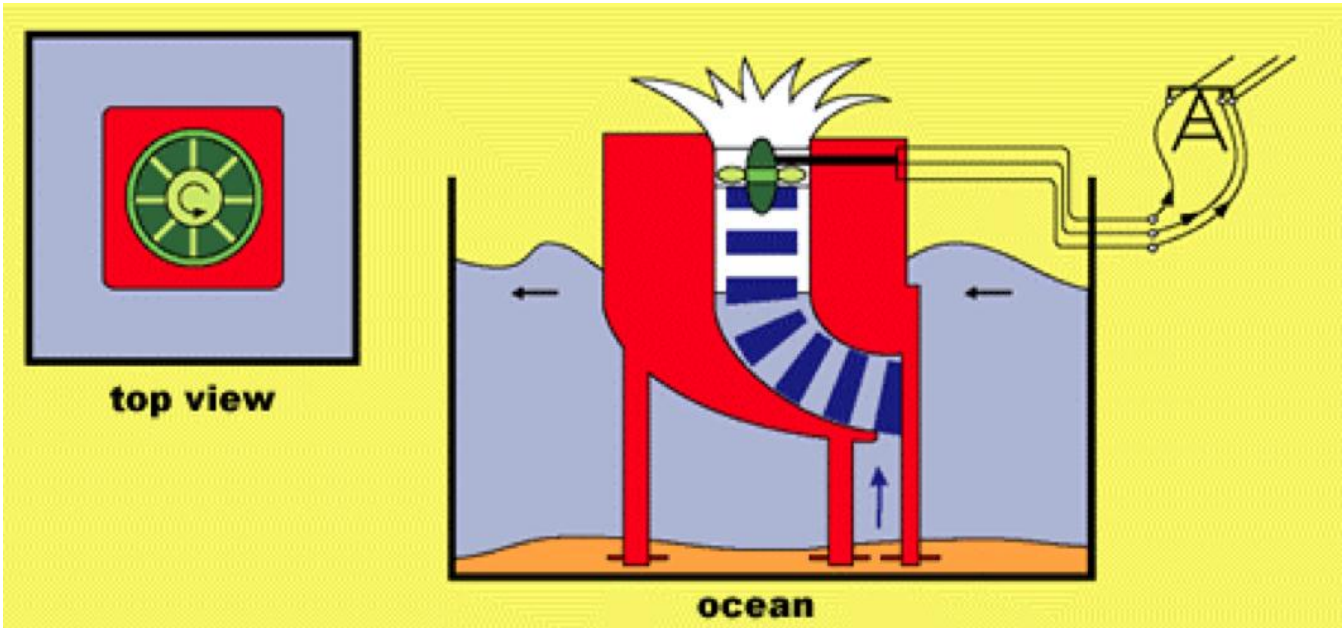


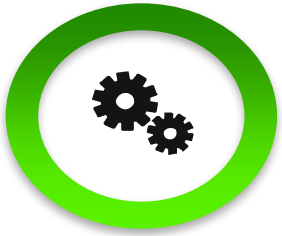
Renewable Energy Systems





Renewable Energy Systems





Renewable Energy RESOURCES
Department of Energy

- **Bi**omass (bagasse) – Potential of 235.7 MW
- **G**eothermal Resource – 1,200 MW
- **S**olar Energy – Average potential 5kWh/m^2/day
- **H**ydropower - 10,500 MW
- **O**cean energy - 170,000 MW
- **W**ind resources – 76,600 MW

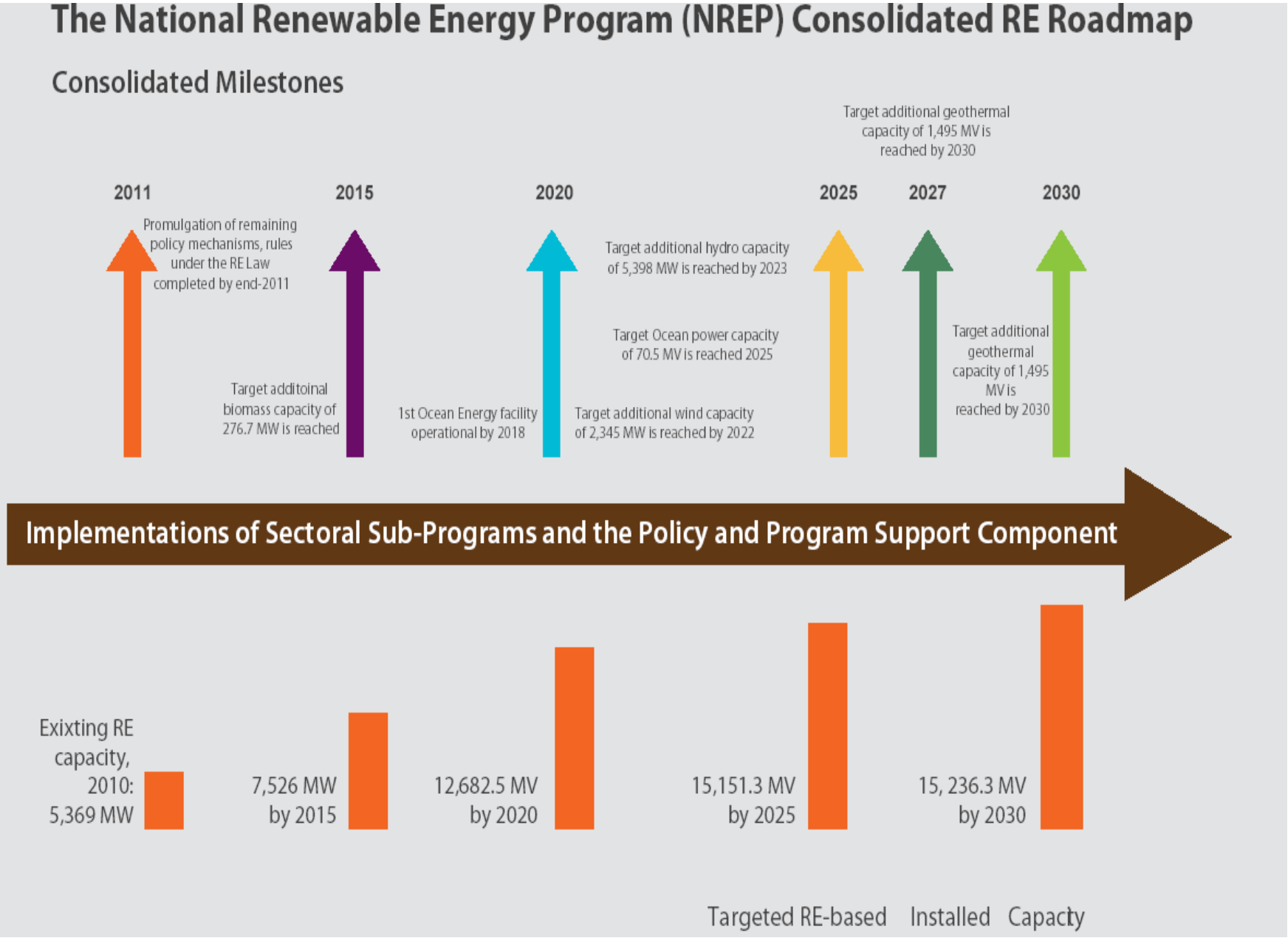
National Renewable Energy Plan TARGETS ,DOE

RE-based On-Grid Capacity Installation Targets

Sector	Installed Capacity, MW as of 2010	Target Capacity Addition by				Total Capacity Addition, MW 2011-2030	Total Installed Capacity by 2030
		2015	2020	2025	2030		
Geothermal	1,972.0	220.0	1,100.0	95.0	80.0	1,495.0	3,467.0
Hydro	3,333.0	343.3	3,161.0	1,891.8	0.0	5,396.1	8,729.1
Biomass	30.0	276.7	0.0	0.0	0.0	2767	306.7
Wind	33.0	1,048.0	855.0	442.0	0.0	2,345.0	2,378 .0
Solar	1.0	269.0	5.0	5.0	5.0	284.0[9]	285.0
Ocean	0.0	0.0	35.5	35.0	0.0	705.0	70.5
Total	5,369.0	2,157.0	5,156.5	2,468.8	85.0	9,855.4	15,236 .3

[1] Based on existing RE Service/Operating Contracts awarded and being evaluated by the DOE. The aspirational target of 1,528 MW solar power capacity will still be pursued.

The National Renewable Energy Program (NREP) Consolidated RE Roadmap



RE Law Issues 2012-2013 STEPS

- Feed-in Tariff Implementation
- RE Trust Fund
- RE Resource Inventory and Assessments
- RPS Issuance and Setting
- Eligibility Criteria Rules
- Grid Impact Studies and Interconnection Agreements
- Green Energy Option
- Net Metering, RE Market
- Processing of RE Applications
- Mainstreaming RE: Information and Education Campaigns, Regional and Area-based Development

Peers' Energy R&D Areas

Solar PV cell research crystal silicon and thin film cells, solar thermal: flat plate concentrators and solar desalination. bioethanol, biodiesel and biogas production from different sources such as rice straw and microalgae. municipal waste to energy, low velocity wind turbines and hydro power, micro grid utilization.

biomass research. bioethanol, biodiesel and biogas production and pyrolysis of municipal solid waste. tidal energy specifically turbine design.

Peers' Energy R&D Areas

biomass applications. Bioreactors and distilling apparatus for bioethanol production. pretreatment methods and crop yield improvement With regards to biogas, ultrasonic application for biogas and carbon dioxide separation are investigated. Micro-hydro system design

solar heater , bioethanol from agricultural waste, biodiesel from waste cooking oil, janitor fish oil, algae, methane from landfills, wind turbine, wave energy, micro hydro for off-grid aquaculture, community power supply applications, smart grids, building energy management, low energy building design alternative construction materials, carbon footprint reduction

Peers' Energy R&D Areas

dye sensitized solar cells using carbon nanotubes, solar PV and air conditioning application of solar thermal systems. vacuum distillation and fermentation for bioethanol, biodiesel from oily seeds and microalgae, biogas from distillery wastes, algal biomass bio-refinery design hydrogen production from methane reformation, low energy building design

dye sensitized solar cells & carbon nanotubes, research on solar thermal, energy efficiency, and Solar PV systems, wind studies, solar-rain potable water systems, bamboo electric vehicle bike, photo-bioreactor aqua-culture of algae, Otec-ocean renewable energy

Peers' Energy R&D Areas

solar thermal for cooling and power generation, HVAC, solar fired power generation, power generation and heating and cooling systems using municipal solid waste, geothermal energy power generation, biogas, waste heat driven ejector systems, waste heat utilization and energy efficiency, and balance of systems for solar PV , wind power systems, and ocean renewable energy

GIS-Based Mapping of Ocean Renewable Energy• Characterization and Performance Testing of Biofuels for Higher Blends and Multi-Blended Biodiesel • Higher Yield and Cost Competitive Biofuel Processes • Anaerobic Waste-to-Energy System from Municipal Solid Waste • Electric Vehicle Component Energy Storage Drive Train Regenerative Systems Indigenous Light Weight High Strength Materials • Cost Competitive Hydrogen Fuel

Energy FGD Summary

- Explore the indigenous Energy Potential
- Turn Road Maps into Terms of Reference for R&D
- Solutions should take up Social Aspect too
- Political Issues: Harmonize the policies, permissions & regulations
- Make Good Quality Resource Assessments & Correct extent
- Develop Standards for proper resource integration
- Resolve Issues regarding the Renewable Energy Act of 2008

Allied Funding Agencies

DOST- Sustainable Energy
SATREPS (JICA) – Sustainable Energy & Environment
ADB- Wind Assessment Studies, EV
USAID – Capacity Training & GIS
AUN-Seed Net – Environmental Studies
PCARI – High Technology Systems

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