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SUSTAINABLE ENERGY PLANning and GHANA' s ACTION PLANning towards the UNITED NATIONS SUSTAINABLE ENERGY FOR ALL by 2030

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SUSTAINABLE ENERGY PLANning
and
GHANA's ACTION PLANning
towards the
UNITED NATIONS
SUSTAINABLE ENERGY FOR ALL
by 2030

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Energy Commission, Ghana

Outline

- Definitions
- Energy Planning Roadmap
- Ghana as a case study

Defining SUSTAINABILITY

Sustainable Development

3 pillars

- **Environment**
- **Economic**
- **Social**

ENERGY Development

based on

- **Environment**
- **Economic / Social**
- **Energy Security**

Defining **PLANning**

- **What do we want to do?**
- **How do we get there?**
- Definition
  - Advanced preparation or arrangement for an event or process based on
    - Knowledge of the **system**, or **comparable** systems (environment/economy)
    - History of the system, or **comparable** systems (environment/economy)
- Then what is **ENERGY PLANNING** ??

Because

Failure to plan

is

a plan for failure

The Energy Security Debate Dates Back Almost 100 Years

In 1912-1914, decided to convert British Navy from (domestic) coal to (foreign) oil despite strong opposition and skepticism

Energy Security - definitions

"Imports are regarded as inherently more unreliable than domestic sources. However, as in other markets, energy imports allow us to access more diverse, and cheaper, resources, than if energy sources were produced solely at home *… the equation of "domestic" and "secure" does not always apply*." (British Cabinet Office Energy Review, 2002)

"Energy security refers to a resilient energy system. This resilient system would be capable of withstanding threats through a combination of active, direct security measures—such as surveillance and guards—and passive or more indirect measures-such as redundancy, duplication of critical equipment, diversity in fuel, other sources of energy, and reliance on less vulnerable infrastructure." (Brown et al., 2003)

Energy Security - definitions

"Energy security for consumers: **available, reliable, affordable, and secure sources of supply; for producers: consistency and predictability of demand requirements**." (JDA, 2006)

"The term **'energy security** includes the pressures on supply from rapidly industrializing countries, the BRICS liberalising markets to produce interdependence between countries, protecting pipelines from attack, and diversifying from fossil fuels to renewables" (Winstone et al., 2007)

"The availability of usable energy supplies, at the point of final consumption, at economic price levels and in sufficient quantities and timeliness so that, given due regard to encouraging energy efficiency, the economic and social development of a country is not materially constrained." (Kowalski and Vilogorac, 2008)

Energy Security issues

- **Vulnerabilities**
  - Source dependence
  - Transit dependence
  - Facility dependence
  - Structural risks
- **Triggers**
  - Natural disasters
  - Politically motivated actions
  - Supply shortages
  - Resource scarcity
  - Terrorism, civil unrest, etc.

What are the policy questions?

- What policy interventions are necessary to ensure adequate supplies?
- What is the cost of alternative route from supply to demand areas?
- What is the cost of fuel use flexibility?
- What is the cost of establishing or expanding reserves.
- What if environmental regulations are made more stringent?

What are the policy questions?

Contd.

- What needs to be done to increase the share of technologies not dependent upon strategic valuable resource?
- What is the cost of increasing energy storage?
- Where are the vulnerabilities in the system?
- How would international agreements affect security?
- What strategies would be best put in place to mitigate against international cartels?

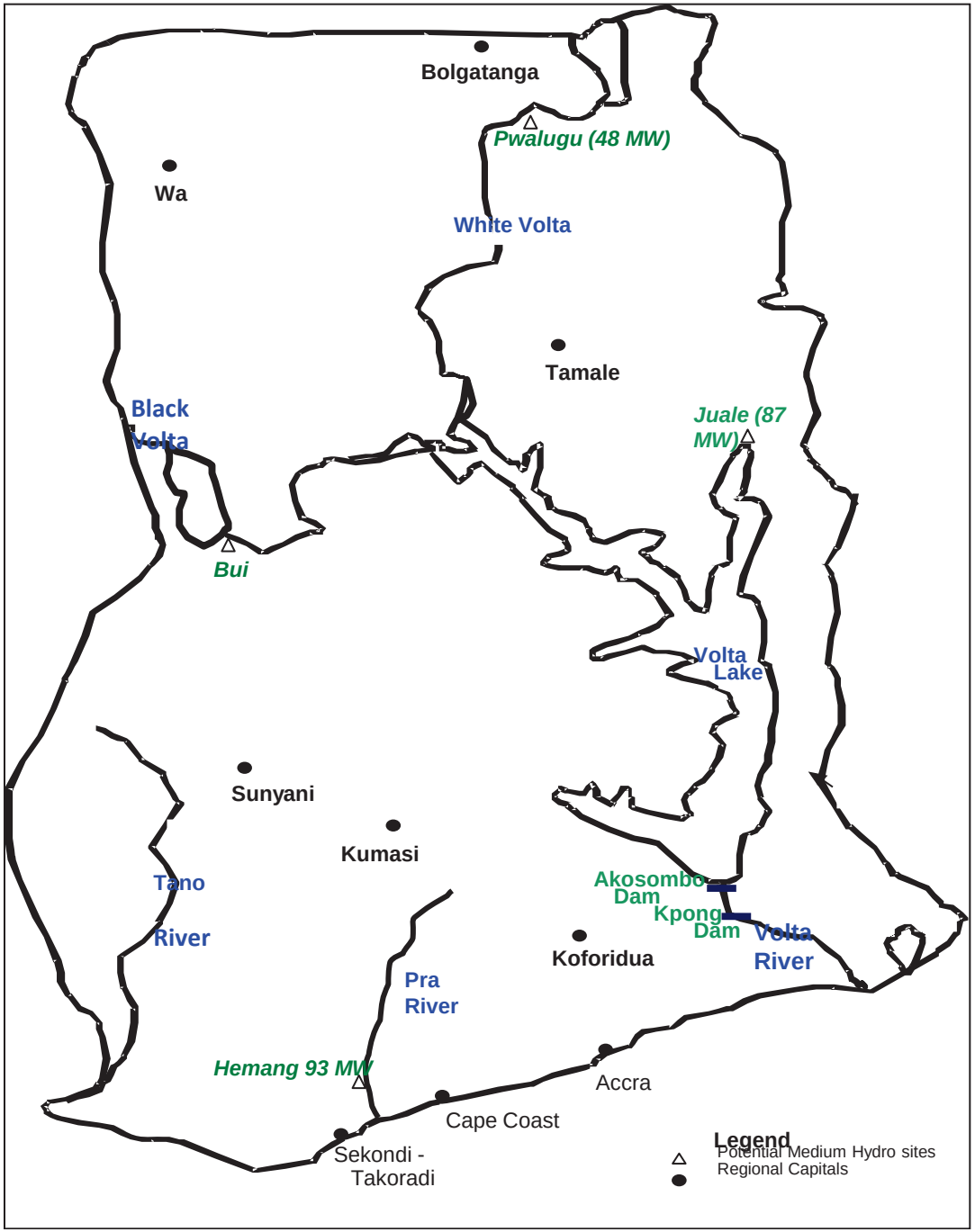
Strategies

- Diversification of supply and fuel mix.
- Improved supply and distribution management and
- Expanded regional integration ??
- Development and enlargement of strategic fuel or stock.
- Fostering international relation and forging new alliances between suppliers and consumer countries.
- Restricting foreign investment ownership, etc.

What is **Strategic** planning?

- What professions do traditionally use the word – STRATEGY ?
  - ✓Military / intelligence **(security)**
  - ✓Sports **(robust / solid team)**

- **Robust / secured / comprehensive planning**



What is energy security ?

Traditional or Strategic?

- Traditional Planning
  - Expansion of facility
  - Least cost supply
  - Simply payback period
  - Cost /benefit analysis
  - Financial benefits
  - Future forecast
    - Cost
    - demand
    - Supply

- Strategic Planning
  - Not only expansion
    - Security of supply
    - Fuel alternative
  - Diversifying: multi-way solution
  - Not necessarily least cost
    - Life cycle cost analysis
    - Optimum cost
  - Future forecast
    - Cost
    - demand
    - Supply
    - Environment
    - People's perception
    - Climate change threat

Strategic Energy Planning Roadmap

- Step 1: Initial assessment
  - ➢Situation Analysis
  - ➢Methodology
- Step 2: Design process
- Step 3: Evaluate opportunities
- Step 4: Set the Vision and the goals
  - ➢Evaluate the objectives
- Step 5: Identify the strategic issues
- Step 6: Implementation
    - » Time line for deliverables, Revisions
    - » Risks

Step 1 – Initial Assessment

What is the national opportunity related to Energy ?

- Costs
- Risks
- Opportunities
- Country's image

Situation Analysis

- Stakeholders
  - Who cares about our successes, failures, work, etc.
- Future trends
  - What would be the impact on the nation?
- Market Needs
  - Will demand increase or decrease?
  - Who are our competitors?
- Strengths and weaknesses
  - SWOT, LFA tools help
- Planning Assumptions

Methodology

- Scan the organizational/national sphere
  - Political, social, economic , environment and technical
- Identify driving forces in the sphere ; changing demographics, competition, taste, etc.
- Identify major issues and opportunities facing the organization/nation
- Use available tools –
  - SWOT, Logical Framework Analysis (LFA), etc.
  - MESSAGE, WASPS, (specialized) etc.

Step 2 – Design Process

- **How much energy and in what forms do we need?**
  - ❖Bottom up?
  - ❖Top down?
  - ❖Energy mix
- **Integrated Resource Planning**
  - ✓What are the best ways to meet these needs?
    - Imports, DSM, indigenous, mix
  - ✓ Gap between the demand and the supply
- **Barriers to the vision**

Step 3.-Evaluate opportunities

- List the opportunities
  - ❖Energy supply Scenarios
    - (Baseline, moderate, high) If we have energy and then what?
  - ❖Impact on the economy.
  - ❖Set targets to determine scale of initial efforts;
    - resource requirements
  - ❖Prioritize opportunities
    - Efficiency measures
    - Supply options
    - Timing is key !!!
    - DSM and supply mix.

Step 4. Set the Vision, set the goals

- Goals to achieve – strategic goals
- *Goals*
  - ❖Specific
  - ❖Measurable
  - ❖Acceptable to partners/colleagues
  - ❖Realistic
  - ❖Timely
  - ❖Extending to the capabilities of partners
  - ❖Rewarding

The Objectives

Evaluating the objectives

- Is it measurable?
  - Performance indicators to track progress
- Is it achievable?
  - When?
- Is it motivating?
  - How?

Step 5: **Identify the Strategic Issues**

- Key obstacles to our vision
- Are they specific enough to suggest strategies to overcome or resolving them?
- In what direction do we move to overcome the barriers?
  - ❖Is it achievable in the planning period?

Step 6. - **Implementation**

- Design implementation strategies.

- Policy development/implementation
  - Ministry of Energy formulate /enact policies
  - Energy Commission undertake policy analysis and make policy recommendations to the Ministry.

Time line

- First US Strategic plan took 9 months involving hundreds of experts. From inception to publication
  - ❖Managers, heads of departments
  - ❖5, 10, 18 months; initial to completion
  - ❖3 , 5, 10, 15, 20 years; span for the SNEP

  - ❖**The longer the term, the less accurate it becomes**
    - 50 years, 100 years
      - – Change in technology, politics, environment, etc.

Major Revisions

- **Triggers**
  - ➢ Change in vision, mandate, institutional changes, legal/regulation, significant economic changes
- **New Plans**
  - ✓ Every **three-four** years?
  - ✓ **Five – ten** years?
- *Remember*
  - ➢ It is important to consider all the relevant parameters and criteria in energy planning
    - ✓ **Economic** and **environmental** issues are key in selecting fuels, technologies, flow-paths in supplying the demand requirements.

Risk

- ***Risk Can Be Thought of in Terms of an Equation***

- **Risk = (Threat x Vulnerability x Consequence) /mitigation**

- **Risk = Probability of failure x Consequences of failure**

Final Document/reports

- Objectives
  - Produce issue papers
  - Identify cross-cutting issues
  - Barriers to progress
- Develop policy recommendations
- Action plans
- Produce Reports
  - One big document?
  - Sliced into parts?
  - electricity final PD.pdf
  - Target groups

Review and proof-reading of report by consultants or independent groups.

ACTION PLANning

- Carefully laying out how to accomplish the strategic goals
  - ❖Objectives/specific results (minor goals)
  - ❖Tactic (method need to achieve objective)
  - ❖Specifying timeline and responsibilities
    - Who needs to do what and when ?

  - ❖Methods to monitor and evaluate
  - ❖Annual / operational / management plans
  - ❖Work plan – for divisions/major functions, etc.
  - ❖Budget - resource needed to accomplish the plan

CASE STUDY:
Ghana's STRATEGIC ACTION PLANning for SE4ALL

- **Mobilisation of resources**;
  - manpower, tools and material
- **Statistics – data gathering**
- **Energy modelling**
  - Top down approach
  - Bottom up approach
- **Demand projections / forecast**
- **Supply projections / forecast**
- **System analysis and policy recommendations**
- **System /energy plan**

Ghana

more information available at

www.ghanaweb.com

- Location: **West Africa**
- Climate: **Tropic-2 seasons**;
  - Dry and rainy
- Official language: **English**
- Population: **24.2 million** *(2010 census)*
- Total area: **92,500 square miles/ 237,000 square km**
- GDP per capita (PPP): **2,500 2010 US dollars**
- **Electricity coverage: 60-65%**
- Major primary economic resources: **Gold and cocoa**
- Sports: **soccer**

Primary Energy Supply Mix	Million TOE		Percentage Shares	
	2010	**2011**	**2010**	**2011**
Hydropower	602	650	*5.8*	*5.7*
Oil	3,283	3,767	*31.8*	*33.3*
Natural Gas	395	772	*3.8*	*6.8*
Woodfuels	6,039	6,138	*58.6*	*54.2*
Total	***10,318***	***11,328***	***100.0***	***100.0***

Sustainable Energy for ALL
SE4ALL

- **Key Objectives**
  1. Ensuring universal access to Modern energy services
  2. Doubling the rate of improvements in energy efficiency
  3. Doubling the share of renewable energy in the global energy mix.

Ghana's situation Analysis

- baseline data on sustainable energy access including an assessment of national initiatives on
  - **1) universal access to modern energy services;**
  - **2) improvements in energy efficiency; and**
  - **3) increasing the share of renewable energy in the national energy mix**

- strengths and weaknesses in specific areas relevant to the sector
  - **such as policy, planning, institutions, finance, monitoring (data and accountability), capacity and partnerships**

Key objectives adopted towards the **attainment of SE4ALL**

i. **Review** existing **policie**s and **interventions** to identify **existing gaps**
ii. **Identify** the **key bottlenecks** to the implementation and attainment of the UN SE4ALL goals by 2030;
iii. **Develop cost-effective** solutions to accelerate progress ; and
iv. **Design** an **action plan** for implementing any indicative interventions; and
v. **Monitor progress of implementation** of the Action Plans

METHODOLOGY used to develop the Country ACTION PLANS

1. Technical team set up
2. A desk review of national policy documents, reports
3. Roadmaps was drawn covering universal access to energy, renewable energy and energy efficiency
4. Consultative meetings with Stakeholders to review the initial findings.
5. The key interventions, bottlenecks and solutions were prioritized using the method of ranking (high/medium/low) and selection criteria (impact, sustainability, speed, resources).

Formation of Working Groups

- **Energy Sector**
  - ✓ Electricity/Power
  - ✓ Petroleum
  - ✓ Renewables and woodfuels
  - ✓ Energy Efficiency

- **Economic Sectors**
  - ✓ Residential
  - ✓ Industry
  - ✓ Transport
  - ✓ Agriculture and Fisheries
  - ✓ Commercial/Services

Social Enterprise

Civil society groups

Action Plans

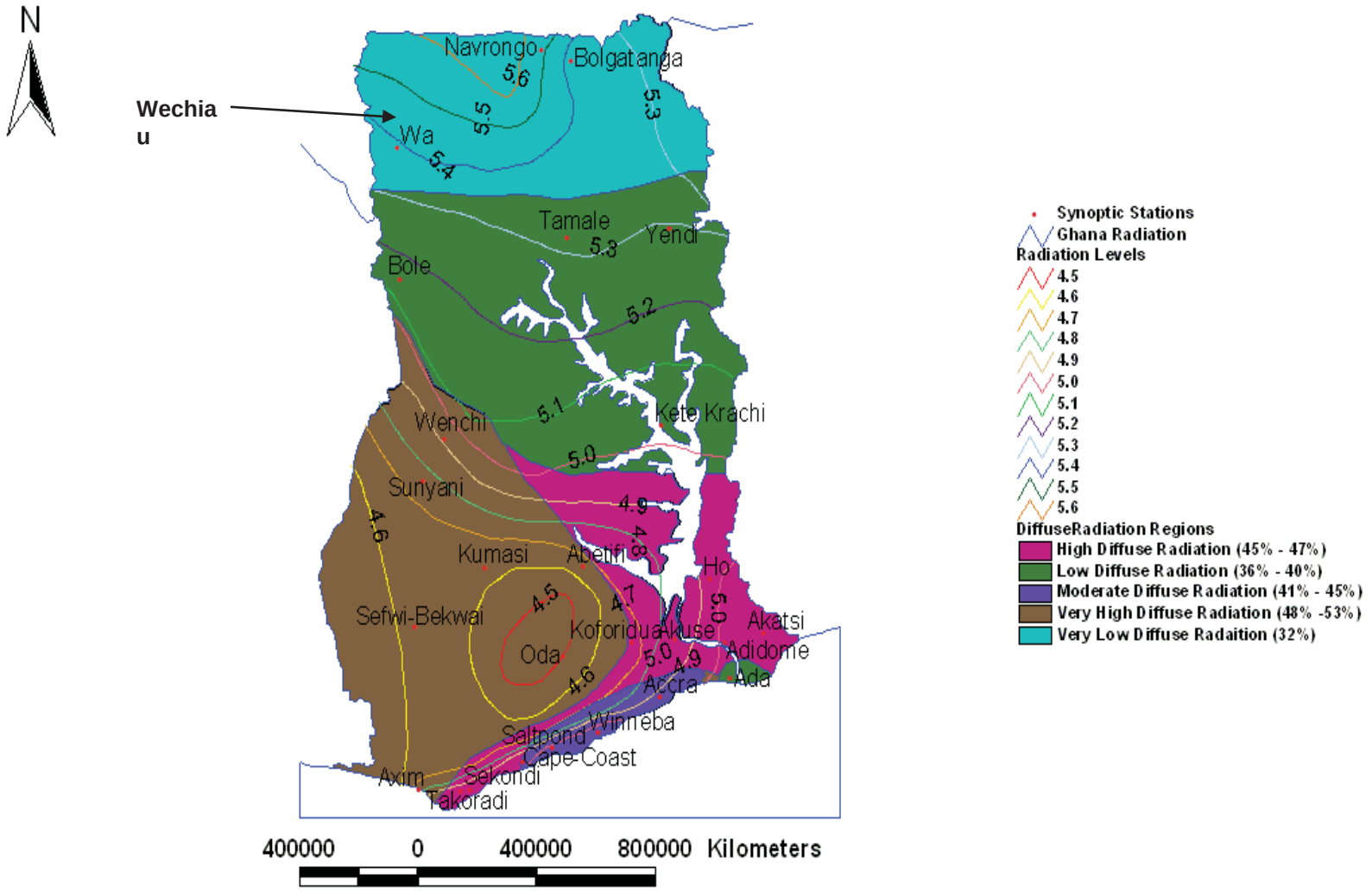
- SE4ALL

Electricity

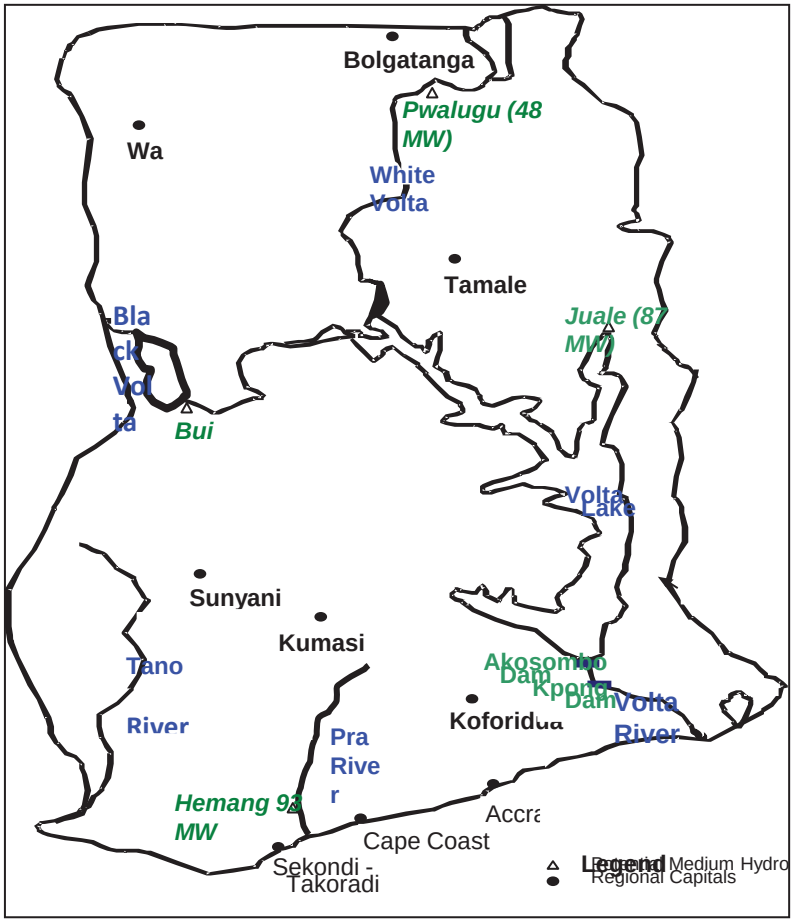
- In terms of Universal Access to Electricity, Ghana has set itself the target of achieving is 100% universal Access to Electricity by the year 2020.
  - National access as at 2011 was 72%
  - Future generation sources will largely come from natural gas.
  - 10% is set for *Renewables largely coming from hydro, solar, wind and biomass*.

Sources of Electricity	Installed Capacity MW	Generation GWh		Percentage Shares	
		2010	2011	2010	2011
Hydropower	1,180	6,996	7,561	*69*	*68*
Thermal power	990	3,171	3,639	*31*	*32*
Total	***2,170***	***10166***	***11,200***	***100***	***100***

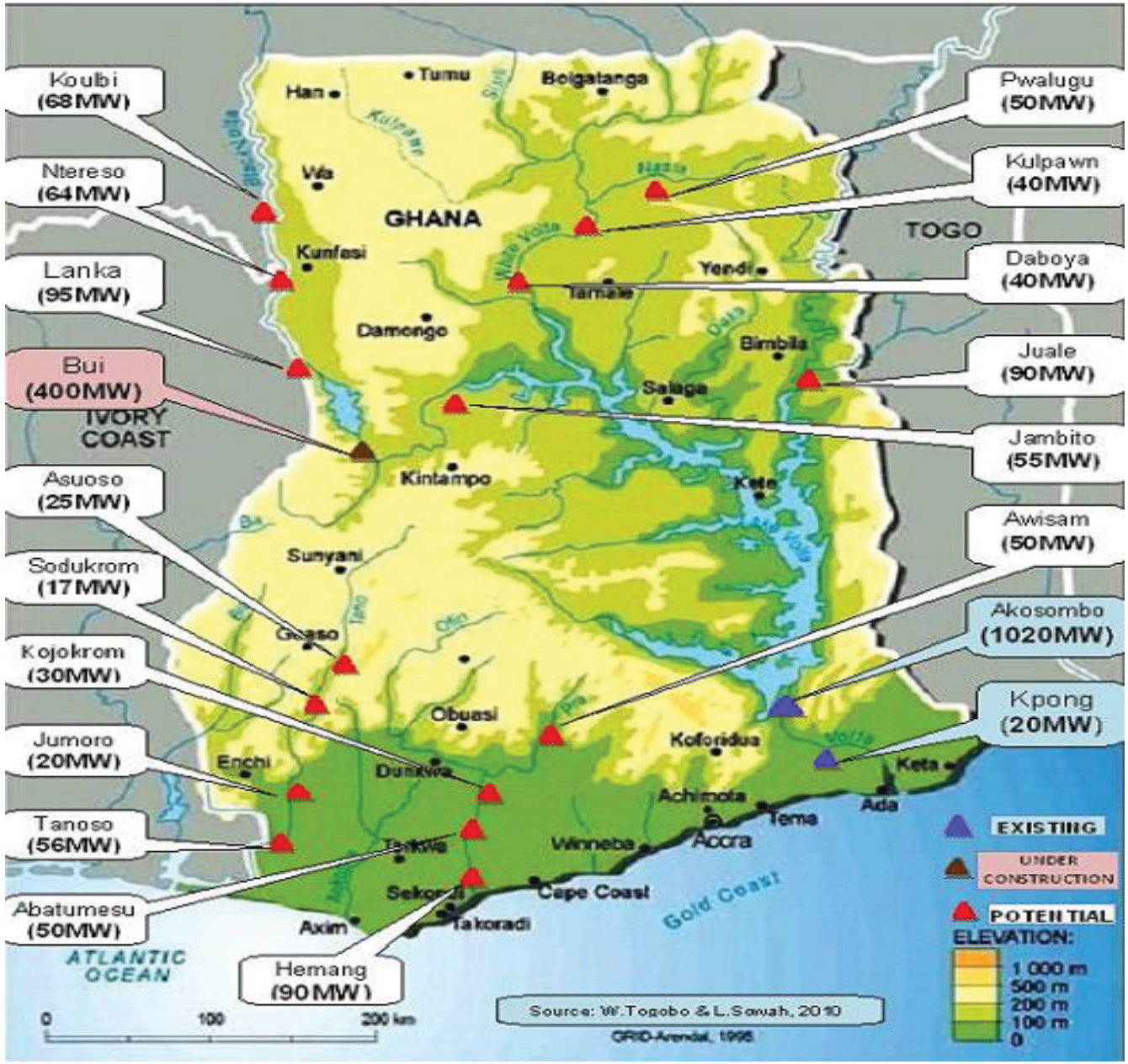
Solar Radiation Map of Ghana



Potential Hydro power sites and the national grid



HYDRO POWER SITES IN GHANA



Renewable Energy Law - highlights

- The object of this Act is to promote the sustainable development and utilization of Renewable Energy resources for electricity and heat generation
- To make the grid **“open access”** to renewables
- Regulatory framework for grid-connected systems
- Innovations to overcome high initial costs
- Ensuring good quality equipment and installations
- Role of government
- Role of the Private Sector
- Role of the utilities

Renewable Energy Law Provisions

- **Connection to Transmission and Distribution Systems**

  An operator of a transmission or distribution system shall connect a generator of electricity from RE resources within the coverage of the transmission or distribution system where a generator of electricity from RE resources so requests.

- **Feed-in- Tariff Scheme**

  - To guarantee the payment for electricity generated from RE resources
  - Feed-in-tariff rates shall be set by PURC (Public Utility Regulatory Commission of Ghana) after enactment
  - Consideration: technology being used and reasonable rate of return.

- **Renewable Energy Purchase Obligation**

  - An electricity utility shall purchase a specified percentage of its total purchase of electricity from RE resources
  - Consideration: technology being used and the net effect of the cost of RE on the end user tariff.

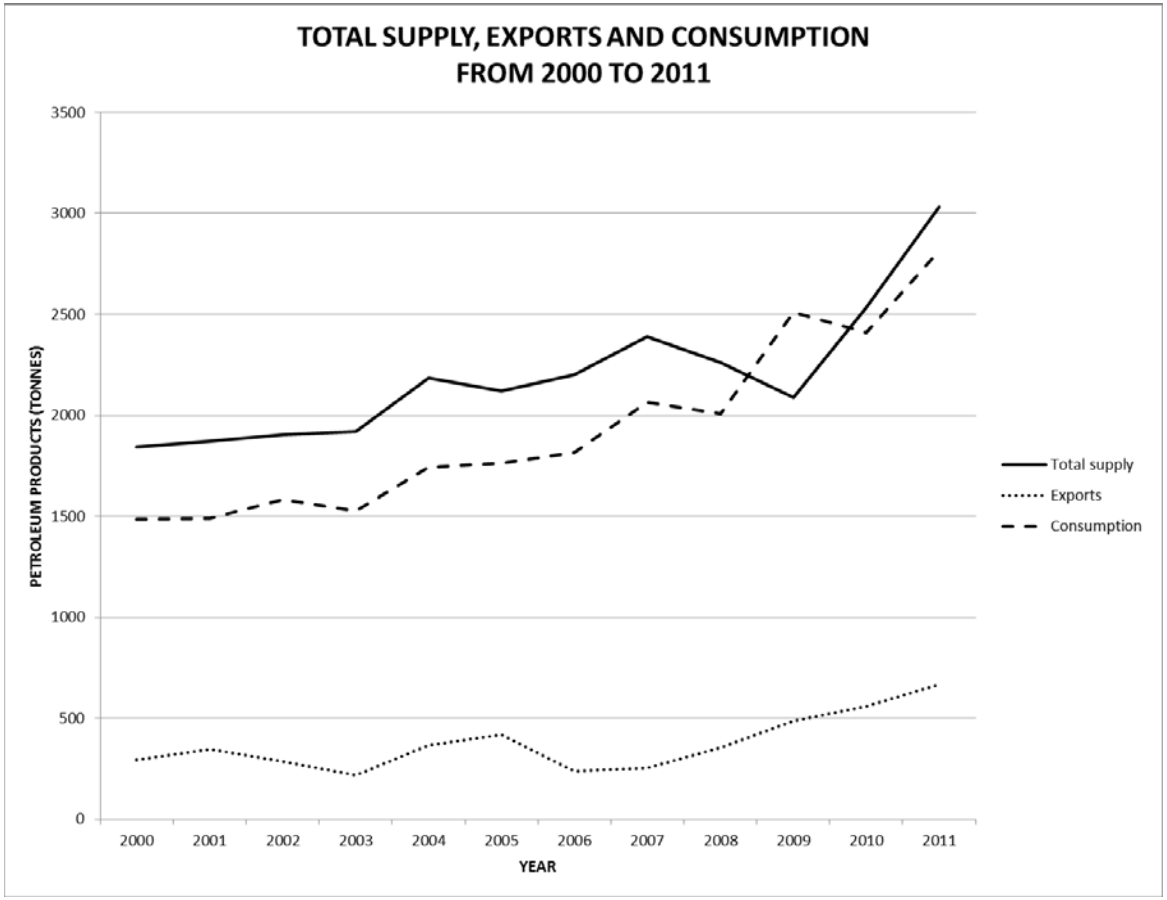
- **Establishment of Ghana Renewable Energy Fund *(GREEN Fund)***

  GREEN Energy Fund to provide financial resources for the promotion, development and utilization, research of RE resources, as well as the provision of production based subsidies for RE generation.

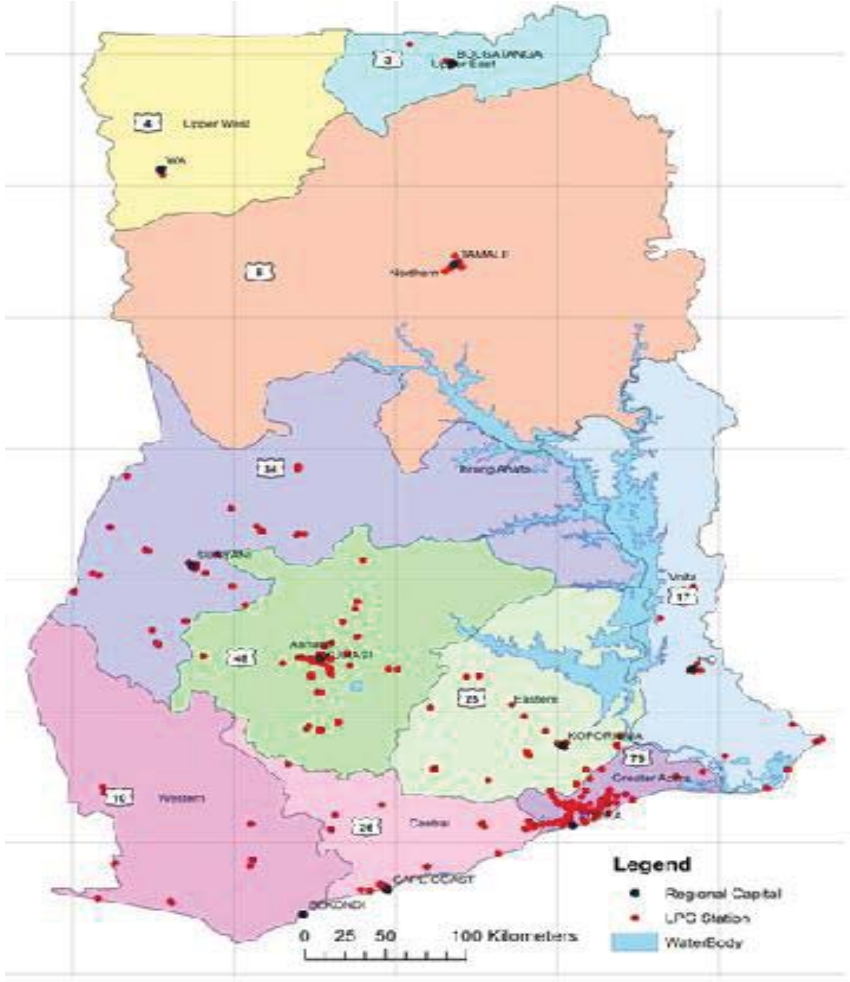
Petroleum product consumption for 2010 and 2011

PETROLEUM PRODUCT	2010	2011	*CHANGE*
	1000 tonnes		*%*
LPG	178.4	214.5	*20.2*
Gasoline	737.8	807.0	*9.4*
Premix	32.4	45.5	*40.4*
Kerosene	49.3	62.4	*26.6*
ATK	108.4	135.3	*24.8*
Gas oil	1,271.9	1,511.5	*18.8*
RFO	30.9	37.5	*21.4*
Total	**2,409.1**	**2,813.7**	***16.8***

Source: National Petroleum Authority, 2012.


TOTAL SUPPLY, EXPORTS AND CONSUMPTION
FROM 2000 TO 2011
PETROLEUM PRODUCTS (TONNES)
3500
3000
2500
2000
1500
1000
500
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
Total supply
Exports
Consumption

Improving distribution of LPG outlets



Promotion of improved cookstoves

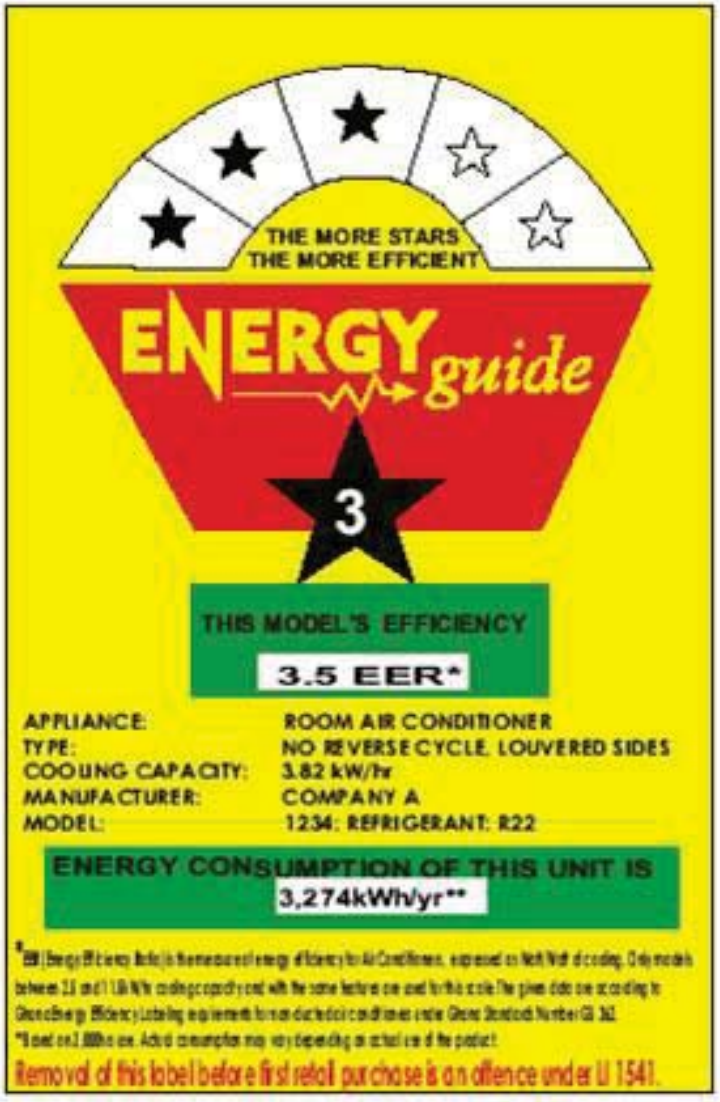
CSIR-IIR Improved Firewood Stove

Toyola Improved Firewood Stove

Traditional Charcoal Stove

Ahibenso Improved Charcoal Stove

The Ghana Energy Efficiency Label



ENERGY COMMISSION

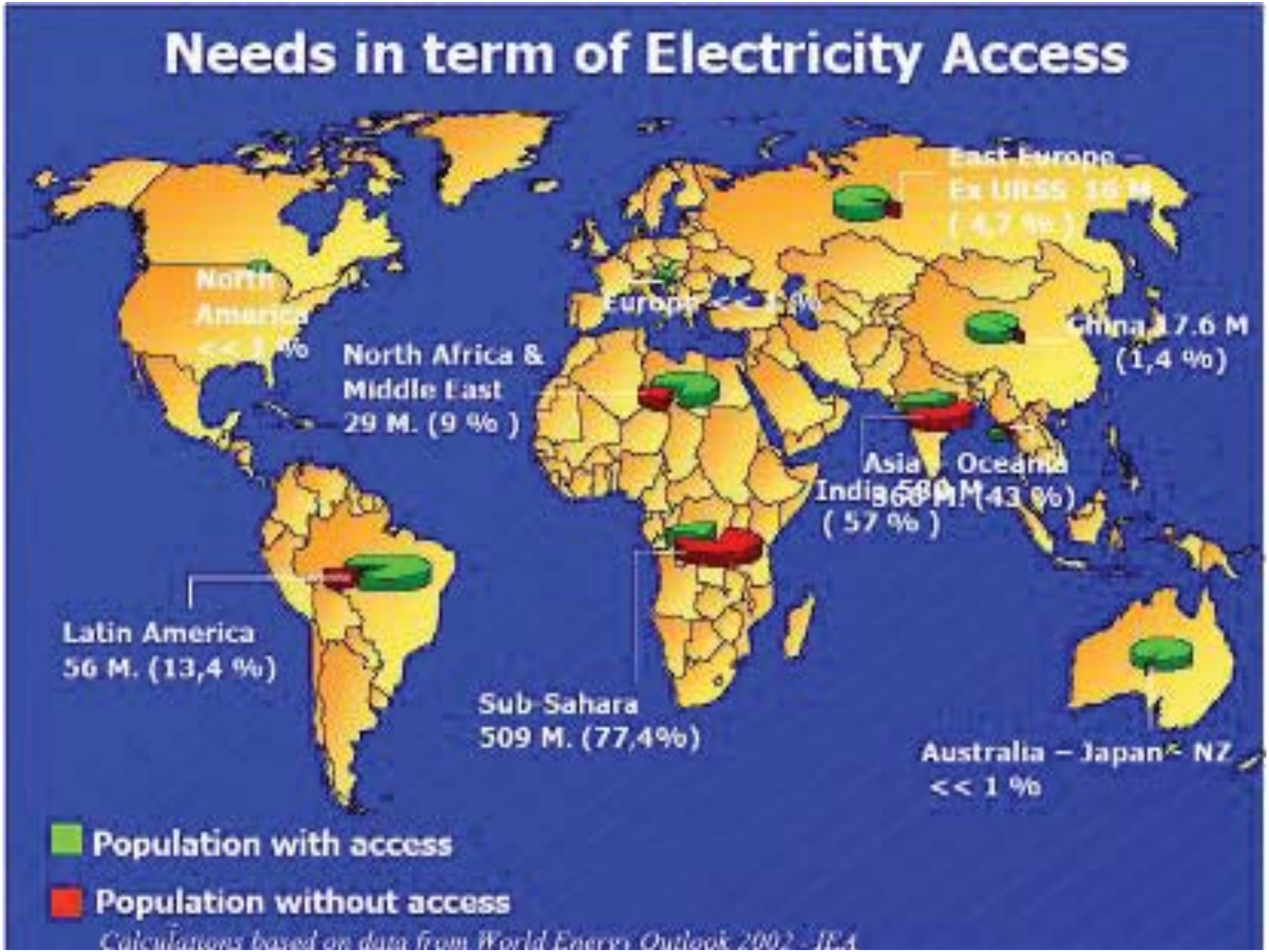
Progress towards SE4ALL

Energy Indicator	Source	2000	2010	2020 *projections*
		Percentage Consumption Share		
Cooking				
	Firewood	**65**	**40.3**	*30/35*
	Charcoal	62	34	*15/20*
	LPG	4-6	18	*50/55*
	Electricity	<1	1	*1*
	Kerosene	1	1	*1*
Lighting				
	Kerosene	52	18	*2/5*
	Electricity	**48**	**65**	*80/90*
	Solar lamps	<1	0.2	*1*
	Dry cell lamps	Negligible	16	*4/18*

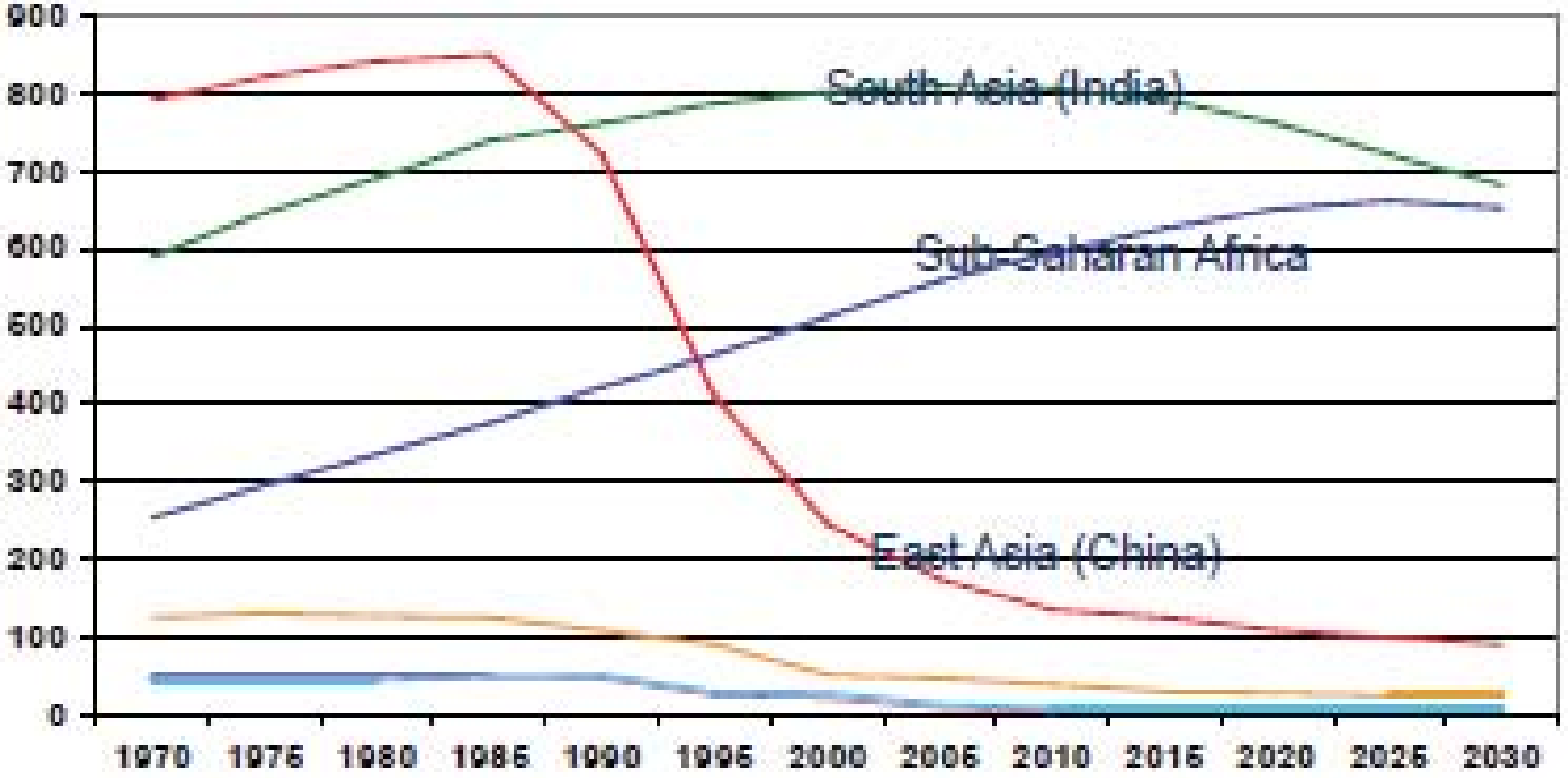
OVERVIEW
Primary Energy Situation in Africa

- **Current Africa's population 1,000-995 million**
  - Accounts for ~ 13-14% of world population
  - Over 80% in Sub Saharan Africa
  - *But* 65-70% live in rural and remote areas (*without access to modern energy like electricity or natural gas; a challenge being confronted by UN SE4ALL program).*
  - Lower Level of Economic Development; *large rural agricultural sector*

- **Share of world primary energy consumption ~3%**
  - Traditional biomass (woodfuels) accounts for 60-90% of primary energy consumption *(traditional biomass linked to deforestation & unsustainable practices)*
  - **Very low levels of Electrification <30%** *(Bad quality; often intermittent, if available)*


Needs in term of Electricity Access
East Europe –
Ex URSS 16 M
(4,7 %)
North
America
<< 1 %
North Africa &
Middle East
29 M. (9 %)
China 17.6 M
(1,4 %)
Asia – Oceania
India 568 M. (43 %)
(57 %)
Latin America
56 M. (13,4 %)
Sub-Sahara
509 M. (77,4%)
Australia – Japan – NZ
<< 1 %
Population with access
Population without access
Calculations based on data from World Energy Outlook 2002 - IEA

(Lack of) Access to Electricity



OVERVIEW:
Electricity - Africa is still darkest

Thank you !!

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