



# UNIDO Industrial Energy Efficiency and Technology Programme

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**Towards an International Energy Management Standard –  
ISO50001**

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# Structure of the Presentation

- I. Energy Use, EE and GHG in Industry
- II. UNIDO's Approach and Programme on EE in Industry
- III. IEE Project in Turkey

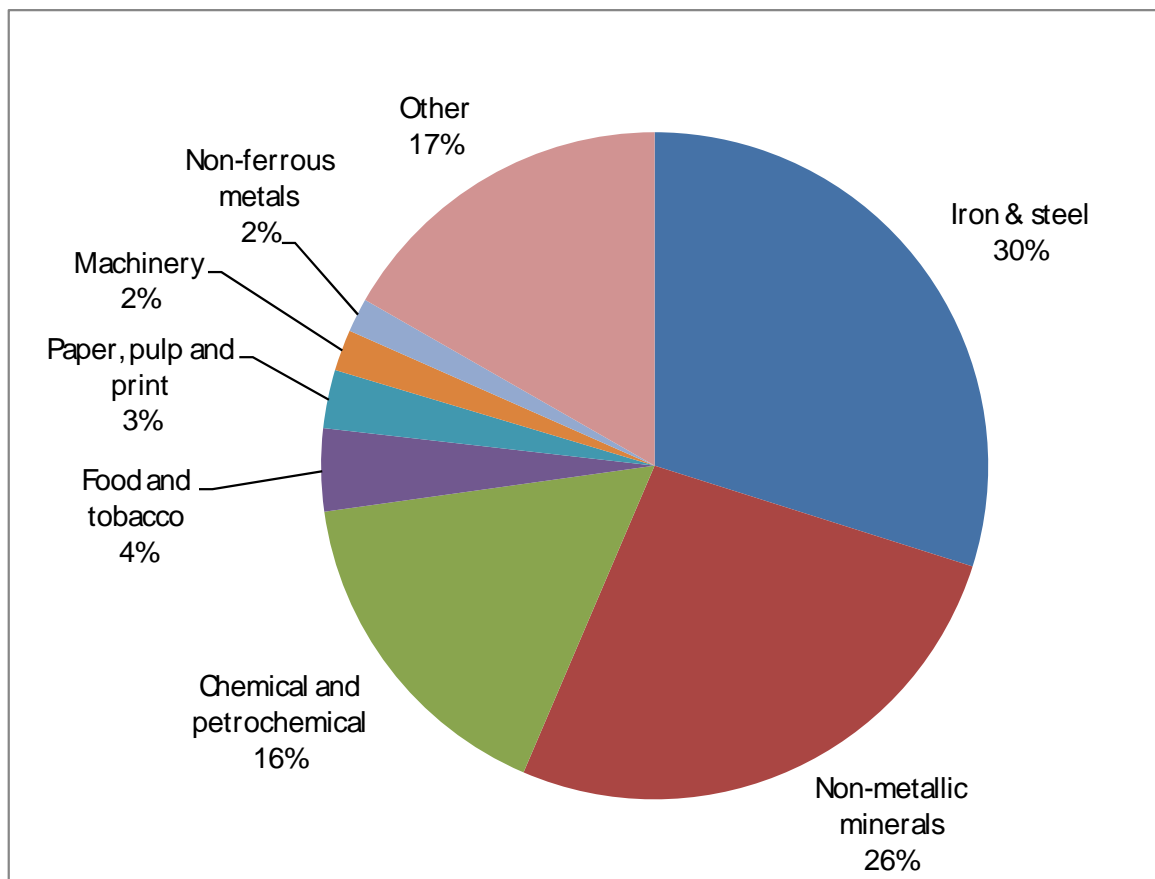


## Context

- ❑ Industrial energy use can be up to **50%** of the total national energy use
- ❑ Globally, industry has the potential to reduce its energy intensity and emissions by up to 26–32%, providing a 8-12% reduction in total energy use and CO<sub>2</sub> emissions. Potentials are above average in DCs and TEs
- ❑ EE is one of the cheapest ways of creating more energy available for the country
- ❑ Global growth of industrial energy demand and CO<sub>2</sub> emissions is concentrated in emerging economies
- ❑ Energy efficiency improvements can increase competitiveness and growth
- ❑ Governments are increasingly aware, and concerned about, both energy security and climate change → assistance is necessary to accelerate development of capacity to respond effectively



## Global CO<sub>2</sub> Emissions by Industrial Sector



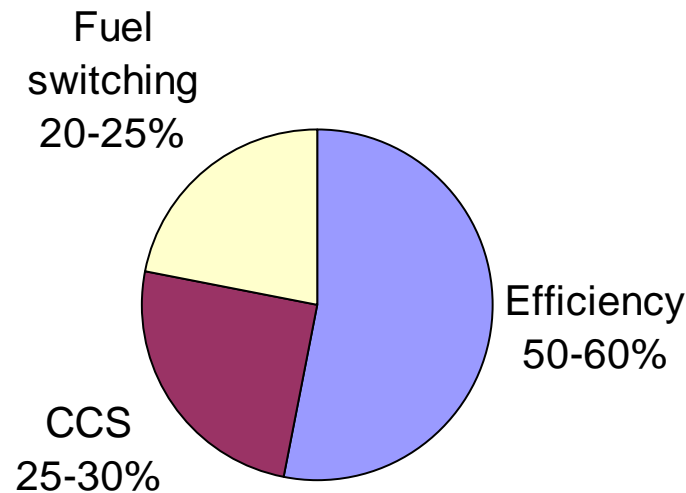
Source: IEA 2008



## Long-Term CO<sub>2</sub> Emissions Reduction Potentials in Industry (compared to Baseline, 2050) (IEA, *Technology Transitions for Industry*, 2009)

Scenario Framework:

Global emissions -50%  
Industrial emissions -20%



Efficiency (on top of baseline) constitutes half of the potential  
This requires a doubling of the technical efficiency improvement rate



## *Industrial Energy Use in Developing Economies*

- ❑ Characteristics of Developing Economies:
  - Industrial energy use can be more than **50%** of the total and can produce supply problems
  - Lead global growth in both industrial energy use and carbon-related emissions
  - Emerging industrial infrastructure requires many new facilities, rapidly built & expanded
  - Includes substantial growth in energy intensive sectors
- ❑ It is much more cost-effective to **build in energy efficiency** the first time than retrofit it later
- ❑ In industry, a missed opportunity for energy efficiency may not reoccur- **for decades or at all** until the original installation fails or becomes obsolete



# Why Isn't Industry More Energy Efficient?

- ❑ Policy and regulatory frameworks, including energy pricing, are not supportive
- ❑ The business of industry is not energy efficiency
- ❑ Facility engineers typically do not become top managers
- ❑ Data on energy use of systems is very limited → difficult to assess performance
- ❑ Lack of capacity to identify and evaluate performance improvements → opportunities to become more energy efficient are overlooked
- ❑ Disconnection between capital and operational budgets
- ❑ Investment constraints and lack of suitable financing
- ❑ Others ...



## UNIDO's Three inter-related thematic priorities



Poverty reduction through  
productive activities



Trade capacity building



Energy and Environment

### UNIDO's Energy and Climate Change Programme

**promoting access to energy for productive uses, and supporting patterns of energy use by industry that are in line with a low-carbon developmental path**



# About UNIDO's Energy Programme

## Technical Co-operation

- Industrial Energy Efficiency
- Renewable energy technologies for industrial applications
- Renewable Energy for Productive Uses, Rural energy

## Service areas

- Policy advice and development support – international forum function
- Capacity building for institutions, enterprises & market players in DCs and TEs
- Technology transfer

## Global Forum

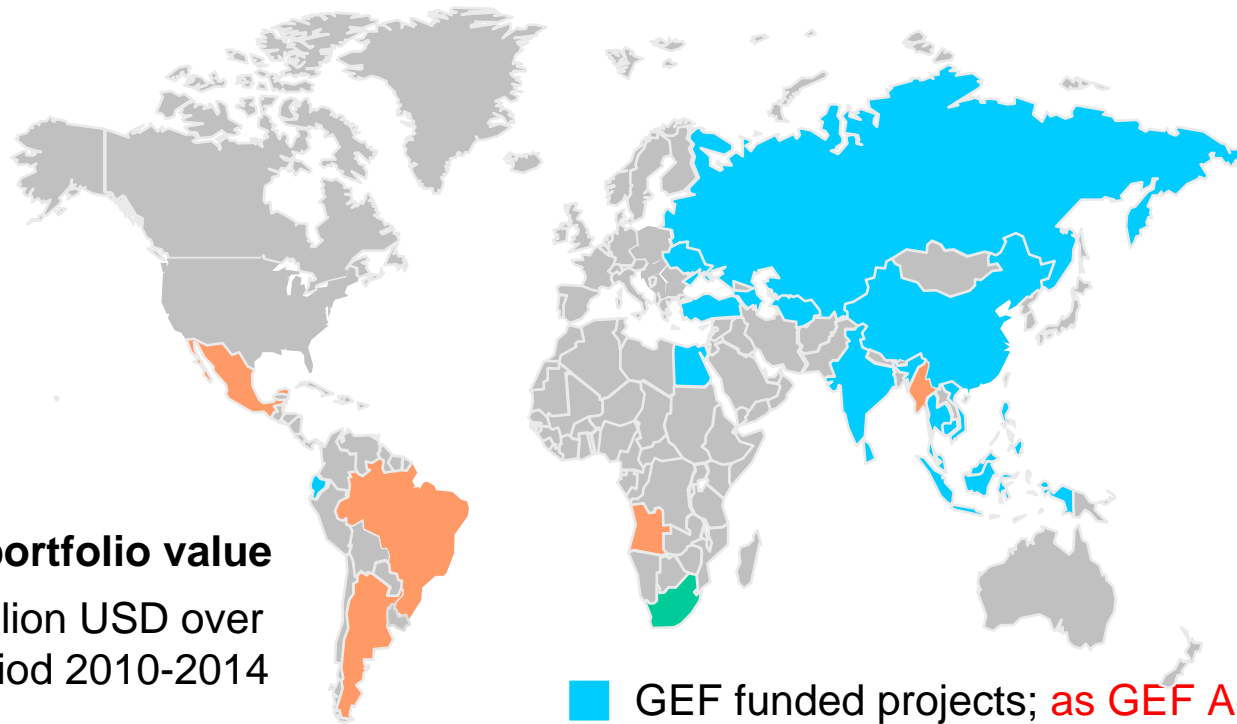
- Co-convener of Technology Transfer under UNFCCC Process
- International Technology Centres
- Partnerships, Networks and global events: UN Energy, SG Advisory Group on Energy and Climate Change



# UNIDO Industrial Energy Efficiency Project Portfolio

## 21 countries:

- Angola
- Argentina
- Brazil
- China
- Ecuador
- Egypt
- India
- Indonesia
- Iran
- Malaysia
- Mexico
- Myanmar
- Moldova
- Philippines
- Russia
- Sri Lanka
- South Africa
- Thailand
- Turkey
- Viet Nam
- Ukraine



### Total portfolio value

500 million USD over the period 2010-2014

### Total UNIDO Budget

65 million USD

- GEF funded projects; as GEF Agency
- Other Energy Efficiency projects
- Projects under development

**UNIDO is an Implementing Agency of the Global Environment Facility**



# UNIDO Industrial Energy Efficiency Program

## Focus Areas

1. **Energy management system standards**
2. **Systems optimization** (steam system and process heating, compressed air, pumps, fans, etc.)
3. **SMEs**

## Why?

- Energy management prerequisite for sustainable and continual improvement of energy efficiency and performance in industry
- EnMS and systems optimization are *very* cost-effective
- Limited policy attention so far for all three topics
- Requires in-depth knowledge, in line with UNIDO strengths



## ***Taking a Comprehensive Approach***

Goal: integrate energy efficiency projects into existing management structures for continual improvement

Elements:

1. Improvement of policy framework and access to investment for EE
2. Energy management standard
3. Capacity building- create cadre of system experts on energy management, system optimization, and train others
4. Access to tools, soft wares, guidelines to identify opportunities and document compliance
5. Recognition of companies that make outstanding efforts to improve their energy efficiency
6. Agreements with industrial sectors that establish plant-specific energy efficiency targets



# Typical Project Structure (key issues)

- ❑ Policy support
- ❑ Capacity building (industry and government awareness, management support)
- ❑ Pilot projects (technology/supply chain)
- ❑ Financing (access, capacity building)



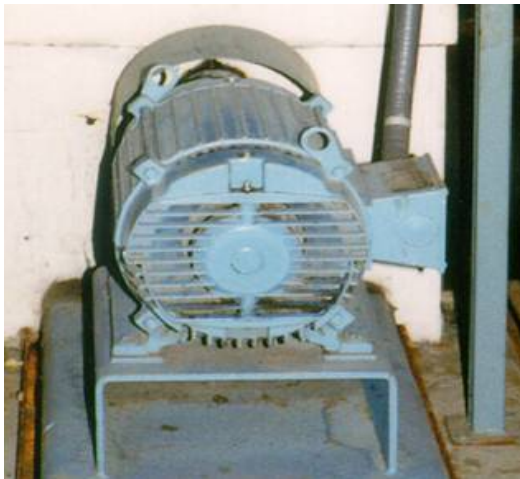
# System optimization: Why a system approach matters in industry

- ❑ Steam and electric motor-driven systems account for more than 50% of final manufacturing energy use worldwide
- ❑ In industry energy efficient equipment per se does not guarantee energy savings when it is part of a bigger system
- ❑ System approach involves looking at how components function together to deliver a certain end-use
- ❑ Energy efficiency improvement potential through system optimization is on average 15-30%



# UNIDO Industrial Energy Efficiency Program

## System optimization: Why a system approach matters in industry



**15 kW motor  
efficiency = 91%**



**Combined motor &  
pump efficiency =  
59%**



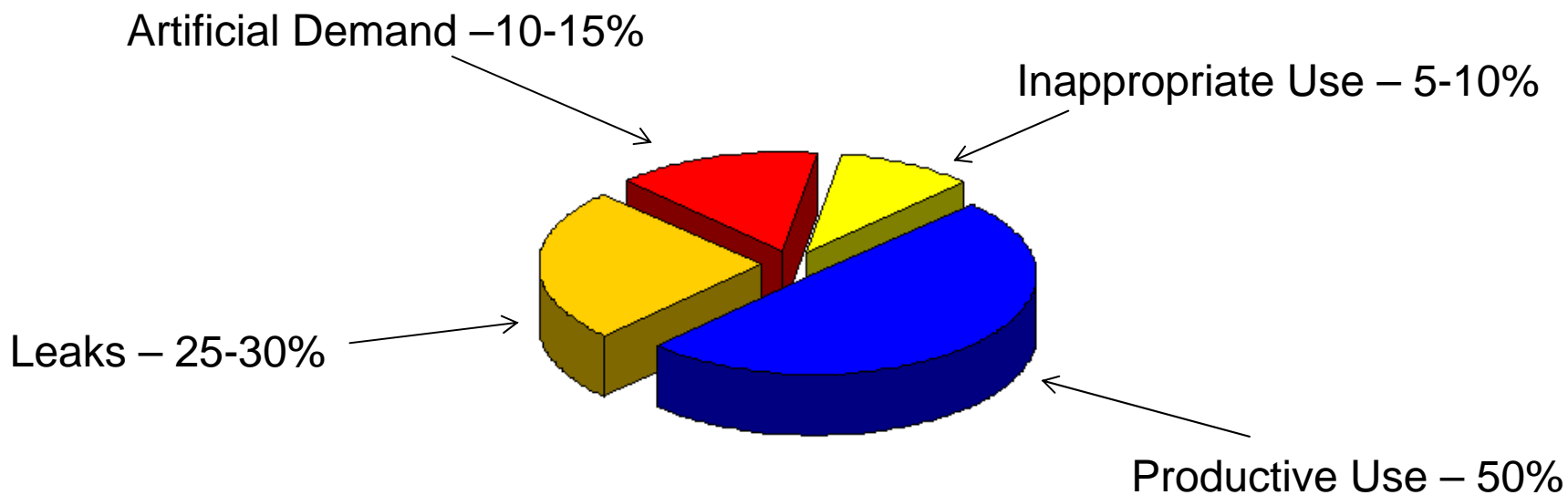
**System efficiency = 13%**

Courtesy of Don Casada, Diagnostic Solutions and US Department of Energy



# *Industrial System Efficiency: Capturing and Sustaining Energy Savings*

**U. S. Department of Energy estimates that half of all compressed air is wasted.**





## ***GEF/UNDP/UNIDO Project on IEE in Turkey***

- Capacity building on energy management and energy system optimization
- Assist industry managers make their factories more energy-efficient, more competitive and better market access.
- Prepare companies for implementation of the new ISO 50001 Energy Management Standard.
- Improved policy framework to facilitating EE, in particular for industry sectors.



## Project Components

- ❑ 1: Strengthening the policy and institutional framework
- ❑ 2: Awareness creation and capacity building of the Turkish industry and private energy service providers
- ❑ 3: Implementation of energy audit and energy management system
- ❑ 4: Demonstration on energy management and systems optimizations
- ❑ 5: Project management



## ***Component 1***

### ***Policy and institutional framework***

- ❑ Output 1.1
  - Data base on energy use in industry strengthened and energy assessments updated
- ❑ Output 1.2
  - Energy consumption benchmark formulated
- ❑ Output 1.3
  - National EnMS developed and implemented
- ❑ Output 1.4
  - 10 Regional EE support centres established
- ❑ Output 1.5
  - Financial mechanism for EE reviewed and updated



## ***Component 2***

### ***Awareness raising, capacity building***

- ❑ Output 2.1
  - Information services improved
- ❑ Output 2.2
  - Awareness and capacity of engineers and owners of industry and financial institutions on EE enhanced
- ❑ Output 2.3
  - Capacity of energy managers on sectoral energy and system optimization improved
- ❑ Output 2.4
  - Capacity of energy services providers enhanced.



## ***Component 3***

### ***Energy audit and EnMS programme***

- ❑ Output 3.1
  - Energy audit skills and capacity upgraded
- ❑ Output 3.2
  - EnMS implemented at selected enterprises
- ❑ Output 3.3
  - Walk-through audit conducted
- ❑ Output 4.4
  - In-depth energy audits conducted



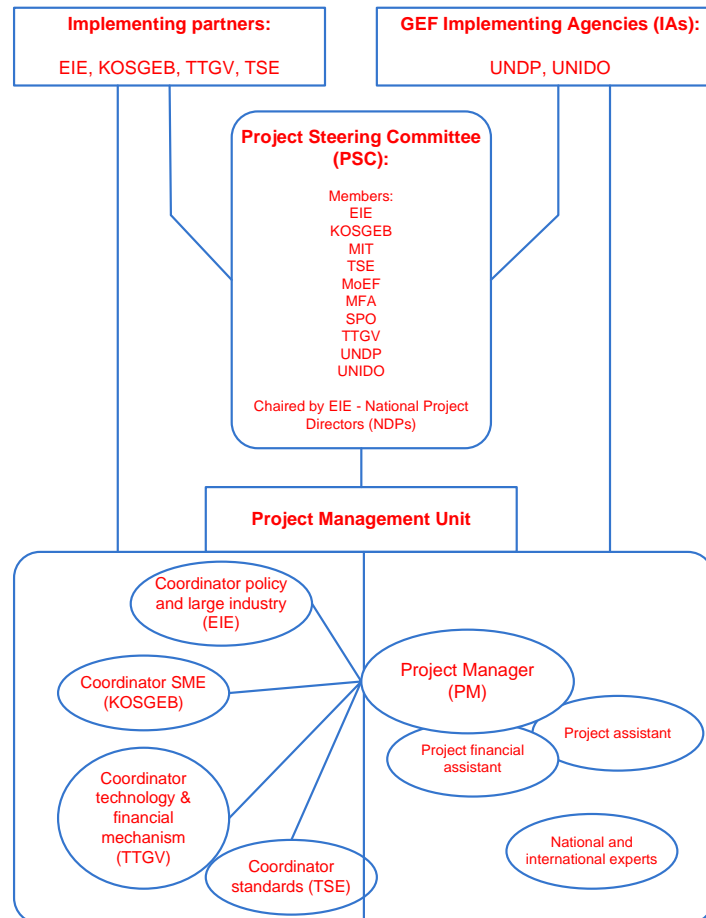
## ***Component 4***

### ***Demonstration projects***

- ❑ Output 4.1
  - Demonstration projects on system optimization and EE processes and technologies implemented
- ❑ Output 4.2
  - Energy consumption benchmark formulated



# Project management





## *Project implementation*

- ❑ Duration: 5 years, Sept 2010-August 2015
- ❑ Funding:
  - GEF (Global Environment Facility): USD 5.95 million for capacity building
    - International and national experts
    - Workshops/training
    - Publications/training materials
  - Co-financing
    - Government agencies (in-kind: staff / facilities; cash: e.g. grants)
    - Beneficiaries (in-kind: e.g., staff; invest in system improvement / EM plans)
- ❑ Next steps:
  - GEF to approve the PD and the CEO ER



## *Stakeholders*

- ❑ **Governmental institutions:** EIE, MTI, MoEF
- ❑ **Public institutions:** KOSGEB, TTGY, TSE
- ❑ **Industry:** industry companies; consultancy companies and consultants.



## GEF 5

- ❑ **From July 2010 to 2014**
- ❑ **Total replenishment USD 4.3 billions**
- ❑ **Turkey under STAR (System for a Transparent Allocation of Resources) USD 21 millions**
- ❑ **Potential project proposals : EE (follow-up of the current project with a component for regional cooperation, RE and Technology transfer: Hydrogen application**



# Thank you for your attention!

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## List of selected projects for the SPWA (I)

The following list of projects have been approved or are in the process of being approved by GEF – the total amount of GEF funding for all 27 projects will be US\$ 45 million.

Strategic Focus: Promotion of Renewable Energy Technologies for Modern Energy Services		
Cape Verde	UNIDO	Promoting renewable energy and energy efficiency on the Brava Island
Guinea	UNEP	Promotion of renewable energy technologies (solar, wind, bioenergy) for electrification and energy services
Guinea-Bissau	UNEP	Promotion of renewable energy technologies (solar, wind, etc.) for productive uses
Niger	UNDP	National Reference Programme of Access to Modern Energy Services with Low Carbon Emissions (Programme PRASE)



## List of selected projects for the SPWA (II)

<b>Strategic Focus: Mini-grids based on Renewable Energy for Rural Electrification</b>		
Chad	UNIDO	Promotion of Renewable Energy based mini-grids for rural electrification and productive uses in Chad
Cote d'Ivoire	UNIDO	Pilot electrification project of communities through mini-grids based on RE / photovoltaic system
The Gambia	UNIDO	Promoting renewable energy based mini grids for productive uses in rural areas in The Gambia
Guinea	UNIDO	Installation of multipurpose mini-hydro power systems (for provision of energy, irrigation, etc.)
Guinea-Bissau	UNEP	Promotion of renewable energy technologies based mini-grids (small hydro / biomass, etc.) for rural electrification
Liberia	UNIDO	Installation of multi purpose min-hydro infrastructure (energy, irrigation, etc.)
Nigeria	UNIDO	Mini-grids based on Renewable Energy (hydro, solar and biomass) sources to augment rural electrification
Sierra Leone	UNIDO	Promoting mini grids based on Small Hydropower
Burkina Faso	UNDP	Promotion of Jatropha Curcas as a resource of Bioenergy in Burkina Faso
Mali	UNEP/ AfDB	Bioenergy Utilisation (electrification and energy services etc. project
Mali	UNDP	Promotion of the use of agrofuels from the production and use of Jatropha oil in Mali



## List of selected projects for the SPWA (III)

<b>Strategic Focus: Energy Efficient Lighting in Public and Residential Sectors</b>		
Burundi	WB	Energy Efficient Lightning Project in Burundi
Cote d'Ivoire	UNEP	Promotion of energy efficiency in public lighting programme
Mauritania	WB	Mauritania CFL deployment Program
Mauritania	UNEP	Promotion of energy efficiency in public lighting
Nigeria	UNDP	Promoting Energy Efficiency in Residential and Public Sector
Togo	WB	Togo - Efficient Lighting Program
<b>Strategic Focus: Promoting Energy Efficiency in Industry, Refrigeration Appliances and Sustainable Urban Transport</b>		
Benin	WB	Energy Efficiency Program in Benin
Burkina Faso	WB	Ouagadougou Transport Modal Shift in Burkina Faso
Ghana	UNDP	Promoting of Appliance Energy Efficiency and Transformation of the Refrigerating Appliances Market in Ghana
Nigeria	WB	Nigeria Urban Transport Project
Senegal	WB	PROGEDE II – Eco-village
<b>Regional Coordination and Cooperation</b>		
Sub-regional	UNIDO	MSP on knowledge management, capacity building including training, coherence and coordination

# Indicators for selected West African Countries:

Source: A = UN DESA 2004; B = O'Sullivan and Hamaide 2002; C = Enerdata 2005; D = CIA 2005; E = UNDP 2004; F = AIE 2004.

	Population 2005 (thousands)	Pop. GR 1990- 2005	% urban pop 2005	Household access to electricity	Primary energy production per capita kgoe/capita	Final Energy consumption per capita kgoe/capita	2004 GDP PPP/Po p (\$/hab)	Electricity Consumption / Population (KWh/capita)	CO2/ Population (t CO2/ Capita)	IDH	Energy Intensity of GDP kep/\$95
Bénin	8 439	3,3%	46	22%	183	228	988	45	0,3	0,421	0,761
Burkina Faso	13 228	3,0%	19	5%	191	234	255	36	0,1	0,302	0,800
Cape Verde	507	2,4%	58	?	49	217	1 183	-	0,3	0,717	0,185
Côte d'Ivoire	18 154	2,4%	46	39%	348	227	1 365	157	0,7	0,399	0,512
Gambie	1 517	3,3%	26	5%	221	221	1 845	121	0,2	0,452	0,703
Ghana	22 113	2,4%	46	35%	280	332	2 183	244	0,3	0,568	0,957
Guinée	9 402	2,8%	37	5%	104	181	2 074	96	0,2	0,425	0,385
Guinée-Bissau	1 586	3,0%	36	5%	62	147	636	74	0,2	0,350	1,067
Libéria	3 283	2,9%	48	?	703	737	884	234	-	nd	3,730
Mali	13 518	2,8%	34	8%	124	160	814	57	0,1	0,326	0,583
Niger	13 957	3,4%	23	8%	57	63	696	26	0,1	0,292	0,392
Nigeria	131 530	2,5%	48	20%	1 610	680	956	73	0,3	0,4666	0,838
Sénégal	11 658	2,6%	55	32%	159	210	1 575	125	0,4	0,437	0,498
Sierra Leone	5 525	2,0%	40	5%	158	190	604	30	0,1	0,273	1,144
Togo	6 145	3,0%	36	12%	176	160	1 413	208	0,4	0,495	1,020
ECOWAS	260 562	2,6%	43	20%	915	454	1 154	88	-	-	-
OECD	1 145 060				3 360	3 224	22 161	8 046	11,0	0,911	0,19
USA	287 460				5 798	5 418	32 042	13 228	19,7	0,939	0,25
WORLD	6 195 660				1 663	1 145	7 008	2 373	1,2	0,729	0,29

<sup>1</sup> Access rate: percentage of connected household