UNIDO Industrial Energy Efficiency and Technology Programme

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Industrial Energy Efficiency
UNIDO

Towards an International Energy Management Standard – ISO50001
Ankara, Turkey, 18 May 2010
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
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 CO₂ 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 CO₂ 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 CO₂ Emissions by Industrial Sector

- Iron & steel: 30%
- Non-metallic minerals: 26%
- Chemical and petrochemical: 16%
- Food and tobacco: 4%
- Paper, pulp and print: 3%
- Machinery: 2%
- Non-ferrous metals: 2%
- Other: 17%

Source: IEA 2008
Long-Term CO₂ Emissions Reduction Potentials in Industry
(compared to Baseline, 2050)
(IEA, Technology Transitions for Industry, 2009)

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

Scenario Framework:
Global emissions -50%
Industrial emissions -20%

- Efficiency (50-60%)
- CCS (25-30%)
- Fuel switching (20-25%)
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

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UNIDO is an Implementing Agency of the Global Environment Facility

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

- Productive Use – 50%
- Inappropriate Use – 5-10%
- Artificial Demand – 10-15%
- Leaks – 25-30%
- Productive Use – 50%
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

Implementing partners:
EIE, KOSGEB, TTGV, TSE

GEF Implementing Agencies (IAs):
UNDP, UNIDO

Project Steering Committee (PSC):
Members:
EIE
KOSGEB
MIT
TSE
MoEF
MFA
SPO
TTGV
UNDP
UNIDO
Chaired by EIE - National Project Directors (NDPs)

Project Management Unit

Coordinator SME (KOSGEB)
Coordinator technology & financial mechanism (TTGV)
Coordinator standards (TSE)

Project Manager (PM)
Project financial assistant
Project assistant
National and international experts
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.

<p>| 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)                  |</p>
<table>
<thead>
<tr>
<th>Region</th>
<th>Implementer/Agency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chad</td>
<td>UNIDO</td>
<td>Promotion of Renewable Energy based mini-grids for rural electrification and productive uses in Chad</td>
</tr>
<tr>
<td>Cote d'Ivoire</td>
<td>UNIDO</td>
<td>Pilot electrification project of communities through mini-grids based on RE / photovoltaic system</td>
</tr>
<tr>
<td>The Gambia</td>
<td>UNIDO</td>
<td>Promoting renewable energy based mini grids for productive uses in rural areas in The Gambia</td>
</tr>
<tr>
<td>Guinea</td>
<td>UNIDO</td>
<td>Installation of multipurpose mini-hydro power systems (for provision of energy, irrigation, etc.)</td>
</tr>
<tr>
<td>Guinea-Bissau</td>
<td>UNEP</td>
<td>Promotion of renewable energy technologies based mini-grids (small hydro / biomass, etc.) for rural electrification</td>
</tr>
<tr>
<td>Liberia</td>
<td>UNIDO</td>
<td>Installation of multi purpose min-hydro infrastructure (energy, irrigation, etc.)</td>
</tr>
<tr>
<td>Nigeria</td>
<td>UNIDO</td>
<td>Mini-grids based on Renewable Energy (hydro, solar and biomass) sources to augment rural electrification</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>UNIDO</td>
<td>Promoting mini grids based on Small Hydropower</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>UNDP</td>
<td>Promotion of Jatropha Curcas as a resource of Bioenergy in Burkina Faso</td>
</tr>
<tr>
<td>Mali</td>
<td>UNEP/ AfDB</td>
<td>Bioenergy Utilisation (electrification and energy services etc. project</td>
</tr>
<tr>
<td>Mali</td>
<td>UNDP</td>
<td>Promotion of the use of agrofuels from the production and use of Jatropha oil in Mali</td>
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**List of selected projects for the SPWA (III)**

### Strategic Focus: Energy Efficient Lighting in Public and Residential Sectors

<table>
<thead>
<tr>
<th>Country</th>
<th>Partner</th>
<th>Project Description</th>
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<tbody>
<tr>
<td>Burundi</td>
<td>WB</td>
<td>Energy Efficient Lightning Project in Burundi</td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td>UNEP</td>
<td>Promotion of energy efficiency in public lighting programme</td>
</tr>
<tr>
<td>Mauritania</td>
<td>WB</td>
<td>Mauritania CFL deployment Program</td>
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<tr>
<td>Mauritania</td>
<td>UNEP</td>
<td>Promotion of energy efficiency in public lighting</td>
</tr>
<tr>
<td>Nigeria</td>
<td>UNDP</td>
<td>Promoting Energy Efficiency in Residential and Public Sector</td>
</tr>
<tr>
<td>Togo</td>
<td>WB</td>
<td>Togo - Efficient Lightning Program</td>
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### Strategic Focus: Promoting Energy Efficiency in Industry, Refrigeration Appliances and Sustainable Urban Transport

<table>
<thead>
<tr>
<th>Country</th>
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<th>Project Description</th>
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<tbody>
<tr>
<td>Benin</td>
<td>WB</td>
<td>Energy Efficiency Program in Benin</td>
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<tr>
<td>Burkina Faso</td>
<td>WB</td>
<td>Ouagadougou Transport Modal Shift in Burkina Faso</td>
</tr>
<tr>
<td>Ghana</td>
<td>UNDP</td>
<td>Promoting of Appliance Energy Efficiency and Transformation of the Refrigerating Appliances Market in Ghana</td>
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<tr>
<td>Nigeria</td>
<td>WB</td>
<td>Nigeria Urban Transport Project</td>
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<tr>
<td>Senegal</td>
<td>WB</td>
<td>PROGEDE II – Eco-village</td>
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### Regional Coordination and Cooperation

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<thead>
<tr>
<th>Region</th>
<th>Partner</th>
<th>Project Description</th>
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<tbody>
<tr>
<td>Sub-regional</td>
<td>UNIDO</td>
<td>MSP on knowledge management, capacity building including training, coherence and coordination</td>
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*Note: WB stands for World Bank, UNEP stands for United Nations Environment Programme, UNDP stands for United Nations Development Programme.*
### Indicators for selected West African Countries:

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<td>Bénin</td>
<td>8 439</td>
<td>3.3%</td>
<td>46</td>
<td>22%</td>
<td>183</td>
<td>228</td>
<td>988</td>
<td>45</td>
<td>0.3</td>
<td>0.421</td>
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<tr>
<td>Burkina Faso</td>
<td>13 228</td>
<td>3.0%</td>
<td>19</td>
<td>5%</td>
<td>191</td>
<td>234</td>
<td>255</td>
<td>36</td>
<td>0.1</td>
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<td>Cape Verde</td>
<td>507</td>
<td>2.4%</td>
<td>58</td>
<td>?</td>
<td>49</td>
<td>217</td>
<td>1 183</td>
<td>-</td>
<td>0.3</td>
<td>0.717</td>
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<tr>
<td>Côte d’Ivoire</td>
<td>18 154</td>
<td>2.4%</td>
<td>46</td>
<td>39%</td>
<td>348</td>
<td>227</td>
<td>1 365</td>
<td>157</td>
<td>0.7</td>
<td>0.399</td>
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<tr>
<td>Gambie</td>
<td>1 517</td>
<td>3.3%</td>
<td>26</td>
<td>5%</td>
<td>221</td>
<td>221</td>
<td>1 845</td>
<td>121</td>
<td>0.2</td>
<td>0.452</td>
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<tr>
<td>Ghana</td>
<td>22 113</td>
<td>2.4%</td>
<td>46</td>
<td>35%</td>
<td>280</td>
<td>332</td>
<td>2 183</td>
<td>244</td>
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<td>0.568</td>
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<tr>
<td>Guinée</td>
<td>9 402</td>
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<td>37</td>
<td>5%</td>
<td>104</td>
<td>181</td>
<td>2 074</td>
<td>96</td>
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<td>Guinée-Bissau</td>
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<td>147</td>
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<td>Libéria</td>
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<td>703</td>
<td>737</td>
<td>884</td>
<td>234</td>
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<tr>
<td>Mali</td>
<td>13 518</td>
<td>2.8%</td>
<td>34</td>
<td>8%</td>
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<td>160</td>
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<td>Niger</td>
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<td>3.4%</td>
<td>23</td>
<td>8%</td>
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<td>125</td>
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<td>5 525</td>
<td>2.0%</td>
<td>40</td>
<td>5%</td>
<td>158</td>
<td>190</td>
<td>604</td>
<td>30</td>
<td>0.1</td>
<td>0.273</td>
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<tr>
<td>Togo</td>
<td>6 145</td>
<td>3.0%</td>
<td>36</td>
<td>12%</td>
<td>176</td>
<td>160</td>
<td>1 413</td>
<td>208</td>
<td>0.4</td>
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<td>915</td>
<td>454</td>
<td>1 154</td>
<td>88</td>
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<td>OECD</td>
<td>1 145 060</td>
<td>3 360</td>
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<td>22 161</td>
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<td>USA</td>
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<td>7 008</td>
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<td>0.729</td>
<td>0.29</td>
<td>-</td>
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</table>

¹ Access rate: percentage of connected household