#### IEA Caspian Energy Policy Dialogue and Training 4 July Session 1: Energy efficiency policy overview

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#### Topics

- The big picture what is energy efficiency and why is the demand side important?
- What benefits can governments expect from implementing demand side energy efficiency policies?
- Why do governments need to get involved?
- How do governments go about formulating efficiency policies?
- How do you identify priority sectors?



## Why do we use energy and what is energy efficient?

- We use energy-consuming technologies because they are economically efficient (i.e. dish washer v. hand washed dishes)
- We all want more comfort, warm food, productivity and mobility with less energy.
- Energy efficiency delivers much more than 'saved energy'.





- Fundamental to economic and social development because it maximises the value derived from energy use.
- Contributes to energy security in both energyimporting and energy-exporting countries.
- Using less allows a country to export more and improve trade balance.
- Displaces the need for new energy resources.
- A central part of any climate change policy

# Energy efficiency is an essential climate change policy

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## Financial and social benefits of energy efficiency policies

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### What drives energy efficiency policy? IEA Survey Results





#### Discussion

#### What are the energy efficiency policy drivers in your country?



#### Why do governments need to get involved?

- Consumers and asset owners often face barriers to implementing energy efficiency
- Governments can intervene to correct these barriers
- Types of barriers:
  - Market Barriers
  - Financial Barriers
  - Information and awareness barriers
  - Regulatory and Institutional Barriers
  - Technical Barriers

#### **Common barriers**

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Barrier	Examples
Market	<ul> <li>Market and price distortions that prevent customers from appraising the true value of energy efficiency.</li> <li>The principal agent or split incentives problem, in which the investor does not reap the rewards of improved efficiency</li> <li>Transaction costs (project development costs are high relative to potential energy savings).</li> </ul>
Financial	• Lack of understanding of EE investments, or aversion to perceived risk on the part of financial institutions.
Information and awareness	<ul> <li>Lack of sufficient information to make rational consumption and investment decisions.</li> </ul>
Regulatory and institutional	<ul> <li>Energy tariffs discouraging EE investment</li> <li>Incentive structures that discourage investment in cost-effective energy efficiency.</li> <li>Institutional bias towards supply-side investments.</li> </ul>
Technical	<ul> <li>Lack of affordable or suitable EE technologies</li> <li>Insufficient local capacities for identifying, developing, implementing and maintaining EE investments.</li> </ul>

### Major barriers facing energy efficiency -IEA survey results

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End-user awareness, low energy prices, financing, and implementation capacity are commonly cited



#### Discussion

What are the biggest barriers to saving energy?



- Where is the potential for energy efficiency?
- What is the scale of the different potentials?
- What are the barriers for achieving that potential?
- What will happen if no action is taken?
- What options are there?
- What are the returns and how much will it cost to get them?
- Who will pay?

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Who are the stakeholders and what are their roles (financer, implementer, planner, evaluator)



## **Types of policies**

- Information and education: Advice/aid in implementation; labelling; professional training and qualification
- Economic instruments: fiscal incentives; marketbased instruments; direct investment; carbon price
- Regulatory instruments: codes & standards; auditing; monitoring; obligations schemes
- Research, Development & Deployment (RD&D)
- Voluntary approaches: public/private sector agreements; public voluntary schemes
- Policy support measures: strategic planning



## Policy formulation - matching Interventions with barriers

Barrier	Policy Intervention
Limited Information	Pilot Programs
	Awareness Campaigns
Perceived Risk	Market transformation
	Public Sector Procurement
	Fiscal policies
Customer Awareness	School curricula
Price or market distortion	Minimum Efficiency Stds
Technology Availability	Industry formation
	Utility Programs
Transaction Costs	Audit requirements
	Audit grants
Access to financing	Revolving funds



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#### Energy Efficiency

Policies and Measures Databases

#### www.iea.org/textbase/pm/index.html

Policies Measures Online Databases

Renewable Energy

**Energy Efficiency** 

Climate Change

Addressing

Provides free, up-to-date data on national policy packages and latest policy developments in renewable energy, EE and climate change worldwide.

- Advanced user-driven search
- Analytical tables showing key policy trends
- Expanding geographical scope to IEA non-member countries
- In collaboration with Clean Energy Solutions Centre, UNEP Risoe Centre and European Commission

## Identifying priority sectors –

#### **Robert Tromop**

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## Countries are adopting ambitious energy and emission reduction targets

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- China Reduce CO<sub>2</sub> intensity of the economy by 40-45% between 2005 and 2020
- India Reduce CO<sub>2</sub> intensity of the economy by 20% between 2005 and 2020
- The European Union: the 20-20-20 programme by 2020 Contribution of energy efficiency to reduce the energy consumption by 20%
- Russia: Reduce the energy intensity of the Russian economy by 40% compared to the 2007 levels.

Improved energy efficiency is often the most economic and readily available means of improving energy security and reducing GHG.



#### The energy efficiency option

#### Where are the largest potential for reducing energy use?

#### What is the most cost-effective way of achieving these reductions?

How to assess the progress and failures of policies?



#### Data are essential to answer these questions

Which data should be collected?

Collecting any statistics has a cost

 but not having proper data can lead to an even higher cost

As a consequence, one should limit the collecting to what is necessary

But what is necessary?



#### **Information from energy balance provides** useful insights...

1973





World: 4 676 Mtoe

World: 8 428 Mtoe

While industrial energy consumption increased by 52% between 1973 and 2008, its share of total final consumption decreased by 5 percentage points

## ... that can help a country prioritise its data collection strategy

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Manufacturing share of total final consumption



The industry mix identifies the largest energy consumers within the manufacturing sector

# The priority will be different from country to country

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The share of industry in total final energy consumption in 2008



The share of industry vary greatly from above 60% to below 5%

# Energy efficiency indicators provides insights on

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- What are the latest trends in global energy use and CO<sub>2</sub> emissions?
- How do factors such as demography, economic structure, income, lifestyle and climate affect there trends?
- Why are countries' energy intensities so different?
- What areas offer the greatest potential to further improve energy efficiency?
- What progress are we currently making in our efforts to improve energy efficiency?
- Which data will best support energy efficiency policy development?



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- 1. Energy efficiency can contribute to all the main goals of energy policy
- 2. Energy efficiency has shown sustained improvement over many years
- 3. Energy efficiency is the single most important option to reduce CO<sub>2</sub> emissions in the future



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## What data will help you identify where the energy efficiency opportunities exist?

#### 25 Energy Efficiency Policy Recommendations

IEA Caspian Energy Policy Dialogue and Training 4 July 2012 Sara.pasquier@iea.org



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Cross-sectoral





Buildings





Lighting

Transport



Industry





Energy utilities

## 25 **Energy Efficiency** Recommendations across 7 Sectors



### About the recommendations

#### G8 Leaders:

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- committed to "maximize implementation of the IEA 25 recommendations on energy efficiency."
- Extensive analysis
- Four criteria
  - Significant energy savings at low cost
  - Address market imperfections or barriers
  - Address significant gaps in existing policy
  - High degree of political support
- Cohesive set
- Early implementation is key

### Cross-sectoral

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- Data collection and indicators
- Strategies and action plans
- Competitive energy markets, with appropriate regulation
  - Private investment in energy efficiency
- 5 Monitoring, enforcement and evaluation





### Monitoring, Verification and Enforcement



MVE activities ensure the integrity of energy requirements by minimizing non-compliance.

## Buildings

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- Mandatory building codes and MEPS
- Netzero energy consumption in buildings
- Improved energy efficiency in existing buildings
- Building energy labels or certificates
- 10 Energy performance of building components and systems



## The savings can only be achieved if the entire buildings system contributes



## provements in the building shell and energy savings electrical end-uses dominate total CO<sub>2</sub> reductions.



#### 6. Mandatory Building Codes and MEPs





## 7. Net-zero energy consumption in buildings

#### PEH & ZEB are in the agenda on most OECD countries

#### PEH

Total primary energy consumption < 120 kWh/m<sup>2</sup>.yr (heating, cooling, ventilation and hot water + lighting + electrical domestic appliances)

Final energy consumption for heating or cooling  $< 15 \text{ kWh/m}^2$ .yr

#### ZEB

-Heating needs (-90%)-Passive ventilation-Use local renewable energy



PEH (Freiburg)



ZEB (London)





## 8.Improved energy efficiency in existing buildings

- Building Codes (France)
- Mandatory Energy Performance Certificates (the EU)
- Financial mechanisms
- Awareness programs
- Public procurement (the EU)
- •Minimum energy performance requirements ???















### 9. Building energy labels

- Strong tool to improve building ee
- Can address new &/or existing buildings
- Mandatory or voluntary
- Ensure compliance with energy performance requirements in building codes
  - Make energy more visible by sale or rental
    - Provide advice on how to improve ee





## 10. Energy performance for building components

#### Labels

#### Certification

#### Minimum requirements on U value



Ecodesign requirements for windows

# Appliances and equipment

- 1 Mandatory MEPS and labels
- 12

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- Test standards and measurement protocols
- 13
- Market transformation policies







## **11. Mandatory Energy Performance Requirements or Labels**

- Energy performance requirements (Standards) and Labels – a proven costeffective policy tool
- Cornerstone:
  - mandatory regulations
  - S & L combination
- Must regularly update requirements in line with international best practices





## 12. Energy Performance test Standards and Measurement Protocols

Harmonization of Test standards and Measurement Protocols

Use as much as possible existing ISO or IEC test standards but consider local conditions (climatic and usage conditions)

## Lighting

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- 14 Phase-out of inefficient lighting products
- 15 Energy-efficient lighting systems







# 14. Phase out of inefficient lighting systems

- CFLs use ¼ the electricity of incandescent lamps for the same amount of light.
- Since 2007, all IEA countries and many others are in the process of phasing-out incandescent lamps.
- Global savings potential of 5.5% of all electricity & 500Mt CO2 is currently half way towards being achieved.

**Overall efficiency of an incandescent lamp = 2%** 





#### Discussion

- One big challenge in buildings in all Caspian/Black Sea countries is district heating.
- How do the buildings recommendations help you address this challenge?

# Large quantities of waste heat can be leveraged by the system

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- Large amounts of heat goes to waste in thermal power plants (reliable to quantify) and industrial processes (unreliable to quantify)
- This heat can be captured and re-used to heat or cool buildings or other industrial processes



#### District Heating and Cooling (DHC) networks can accomodate a wide variety of energy sources and demands

District heating and cooling networks offer great potential for decarbonisation in urban areas with high demand densities.

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- Low temperature networks can distribute heat (and coolth) to buildings and in areas with increasingly lower demand density...
- ...and make use of increasingly low grade, locally available energy sources
- These include waste heat from power stations, process heat from industry or even from other buildings; RES-H such as solar or geothermal; or CHP



#### DHC networks can lower system costs and increase efficiency through integration

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DHC networks can help accommodate a larger share of renewables in the system...



...and can be decarbonised at a similar pace than electricity, while minimising primary energy use



## Transport



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Mandatory vehicle fuel-efficiency standards

Measures to improve vehicle fuel efficiency

- 18 Fuel-efficient non-engine components
- 19 Eco-driving
- 20
- Transport system efficiency





### **16. Mandatory Fuel Efficiency** Standards



European Union recently improved its fuel standards, bringing it 130 g/km in 2012, which will lead to a projected 19% reduction in CO<sub>2</sub> emissions

> Source: European Commission © OECD/IEA 2012



### **18. Fuel-efficient non-engine** components



Fuel efficient tyres can reduce a motor vehicle's fuel consumption by as much as 5%.



#### **19. Eco-driving**



Eco-driving has the potential to reduce fuel consumption by around 10%.



#### Discussion

#### What is your single biggest transport challenge?

Mobility for commuters, freight infrastructure, congestion, pollution, etc.

## Industry

- 21
  - Energy management
  - High-efficiency industrial equipment and systems
  - Energy efficiency services for SMEs
- 24

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Complementary policies to support industrial energy efficiency







Incremental energy demand by sector and region in the New Policies Scenario, 2009-2035



\* Includes agriculture and non-energy use.

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The largest amount of final energy consumption will be increased by the industry sector during 2009-2035, particularly in developing countries

### 21. Energy management in industry

- Role of energy management systems
- Enable continuous energy performance improvement
- Role of energy management programmes
- Overcome barriers and provide guidance and support for the implementation process

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ISO 50001 has now established international standards for energy management



## Accelerating the uptake of energy management systems

- Government policy and enabling finance has a key role in accelerating uptake – policy package – ongoing process
- Energy management systems +
- Energy management is a tool to change behavior, processes and technologies – ongoing process
- Company buy-in & consultation & dialogue
- Significant co-benefits (can influence investment decisions and contribute to other policy objectives )
- Importance of integrating into business operation and improvement (synergies with other systems/tools)



## 22. High-efficiency industrial equipment and systems



### **Electricity consumption of EMDS**

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- Electric motor-driven systems (EMDS) consume more than 40% of global electricity consumption
  - Motor energy costs account for 95% of motor's life cycle costs
- 64% of global EMDS electricity consumption is made in industrial sector





### **Potential energy savings in EMDS**

<u>Theoretical</u> potential savings of EMDS is around 30% of electricity used, which can reduce 10% of total global electricity demand





23. Energy efficiency services for small and medium-sized enterprises (SMEs)

- L. Capacity and audits
- 2. Information and tools
- **3.** Access to finance



Not all countries are supporting SMEs in implementing energy efficiency actions. A holistic/package approach is needed.



24. Complementary policies to support industrial energy efficiency

Promote investments in energy efficiency

- **1.** Energy pricing
- **2.** Financial incentives
- **3.** Financing mechanisms

## Energy utilities



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Utility end-use energy efficiency schemes



# Utilities as energy efficiency implementers

Advantages:

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- Access to capital
- Relationship with end users
- A familiar brand name
- Existing service and delivery network
- Responsibility to satisfy energy demand
- Disadvantages:
  - Conflict of interest
    - Incentive to sell, not conserve, energy
  - Regulation is needed

Importance of market structure & regulatory frameworks

### **Energy utility recommendations**

- Provide a level playing field for energy efficiency and energy supply options in resource procurement and wholesale markets;
- Oblige energy providers to deliver cost-effective energy efficiency to end-users;
- Require energy customers be provided with cost-reflective pricing and other information they need to manage their energy use; and
- Consider utilizing revenues from end-use energy consumption to fund energy efficiency

### Flash Survey: Energy efficiency delivery

- **1.** Are utilities in your country involved in promoting or delivering energy efficiency?
- 2. <u>How</u> do utilities promote energy efficiency?
  - a. Information and advice
  - b. Funding

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- c. Delivering energy efficiency improvements
- d. Other
- 3. What prevents utilities from doing more energy efficiency?
  - a. No capability
  - **b.** Don't want to reduce their sales
  - c. Not in their remit

### **DSM program requirements**

- Utilities required to offer specified programmes or services
- Examples:

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- PG&E and SCE utility DSM programmes
- Advantages
  - Encourages utility-government dialogue
  - Can be responsive to market needs
- Disadvantages
  - May not be least-cost solution
  - Utilities may lack capacity

### **Portfolio Requirements**

- Utilities must procure a specified resource mix or loading order
- Examples:

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- California's energy efficiency preference
- Ontario's power development plan
- Advantages:
  - Familiar to utility managers
  - Evaluation is built in
  - Stepping stone to integrated planning
- Disadvantages
  - May not be least-cost solution

### **Energy Efficiency Obligations**

- Utilities are <u>required</u> to deliver energy efficiency
- Examples:

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- UK's Carbon Emissions Reduction Target (CERT)
- French and Italian White Certificates programs

#### Advantages:

- Flexibility in how obligations are met
- Delivers low-cost efficiency improvements
- Linkage to secondary markets for trading
- Disadvantages
  - Verification can be expensive
  - Oversight of utility delivery is needed

# Guidelines for setting utility energy efficiency policies

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- Consider carefully the right role for energy utilities
- Utilities are often best at delivering energy efficiency with resource value
  - Establish a regulatory framework that mobilizes utilities
- Distributors/retailers are often best positioned to deliver efficiency programmes
- Maintain strong regulatory oversight BUT avoid unnecessary complexity and procedures
- Consider System Public Benefit or Wires Charges as a way to fund energy efficiency



#### **Breakout discussion**

Which of the IEA 25 Energy Efficiency Policy Recommendations are the most relevant to your country?

What other policies (not mentioned) do you think are important?