ENERGY STATISTICS

Introduction to Energy Statistics and to IEA Energy Statistics

Why and how to collect necessary energy statistics

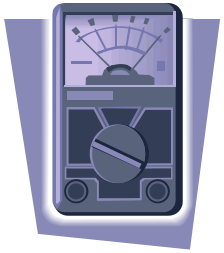
IEA-UNESCWA Energy Statistics Training

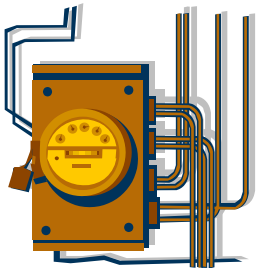
International Energy Agency

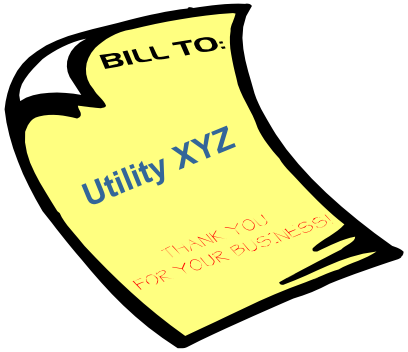
Any socio-economic category needs statistics to operate. This is also true for energy statistics

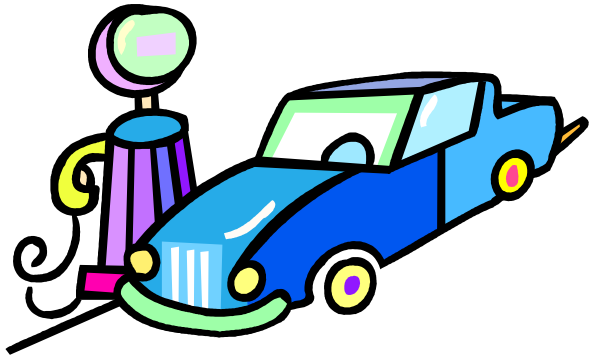
A few examples:

- **Households:**
  - electricity consumption of houses,
  - heating bills,
  - mileage of cars,







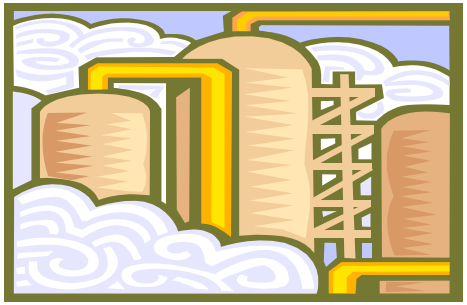


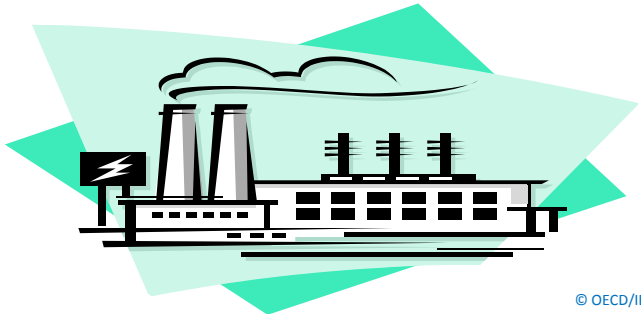
Any socio-economic category needs statistics to operate. This is also true for energy statistics

A few examples:

- **Company managers**
  - **Energy bills, consumption/tonne, where to save**

  - **Even truer for energy companies**
    - **Refinery: throughputs, stocks**
    - **Electricity generation: fuel input, electricity production**





Any socio-economic category needs statistics to operate. This is also true for energy statistics

A few examples:

- Households: mileage of cars, electricity consumption of houses, heating bills, etc.
- Company managers
  - Energy bills, consumption/tonne, where to save
  - Even truer for energy companies
    - Refinery: throughputs, stocks
    - Electricity generation: fuel input, electricity production
- Analysts of the energy market: oil, gas, etc.
- Traders, banks, universities, etc.
- Policy makers

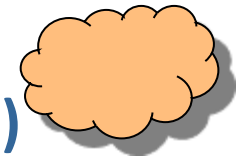
Importance of energy statistics for policy makers

- **IEA Member countries** have an obligation to hold 90 days of stocks (net imports/consumption)
  - Need reliable and timely data on imports, consumption and stocks

- **OPEC Member countries:** production vs quota
  - Need reliable and timely data on production

- **EU Member countries:** obligation to have a minimum share of electricity consumption coming from renewables
  - Need reliable data on renewables

- **Annex 1 countries to the Conference of Parties:** respect of the engagement they have ratified when signing the Kyoto Protocol (70% to 80% of GHG come from fuel combustion)
  - Need reliable data on both supply and demand



What statistics to collect?

Households

Services

Coal

Physical Unit

Agriculture

Energy Unit

Cooking

Heating

Oil

Natural Gas

Electricity

Industry

Socio-Economic

Transport

Biomass

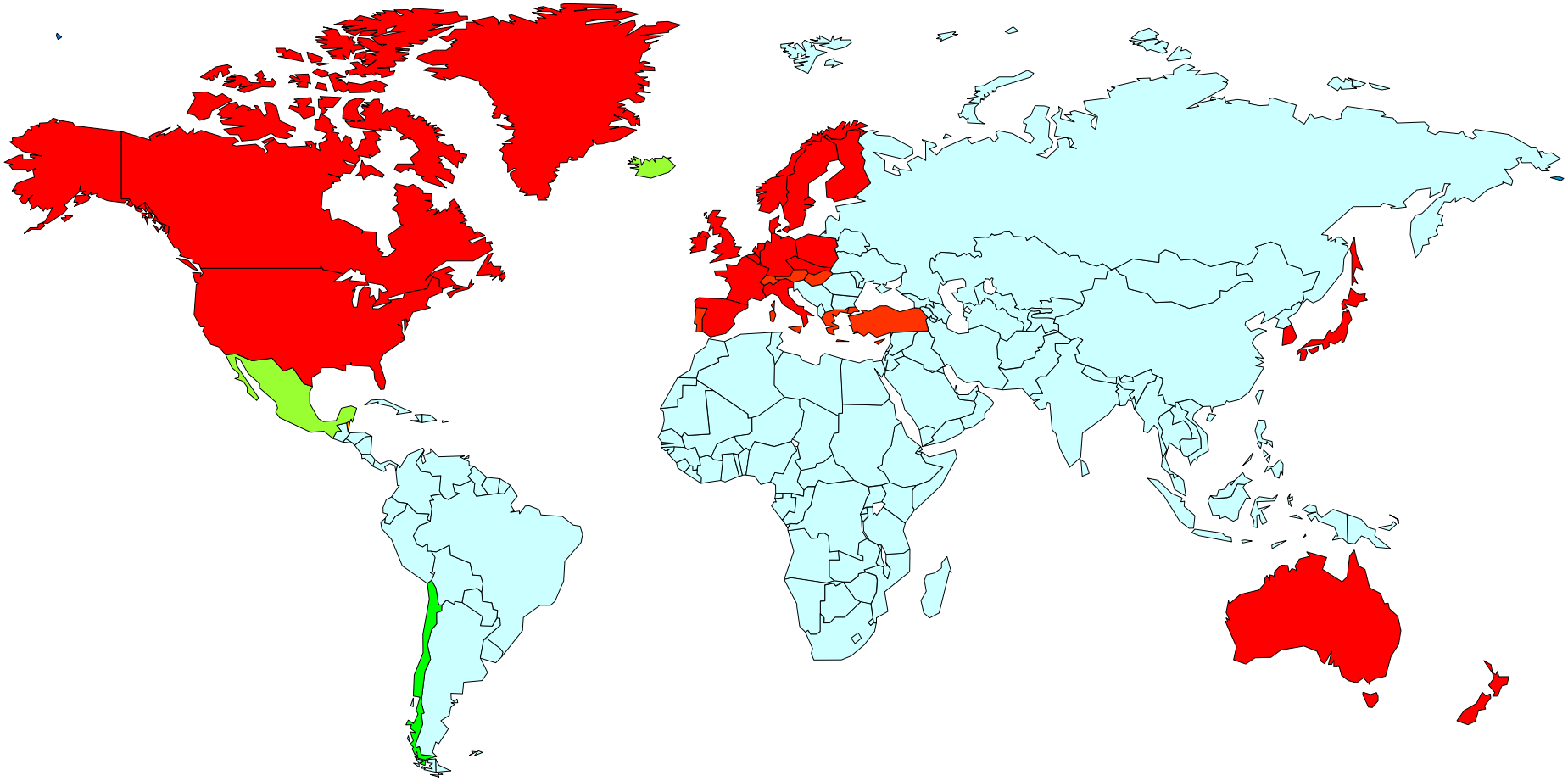
Lighting

Money

What statistics to collect?

- Collecting any statistics has a cost
- However not having proper information could lead to higher costs
- So, limit the collecting to what is necessary
- What is necessary depends on your needs

How IEA Statistics developed over time

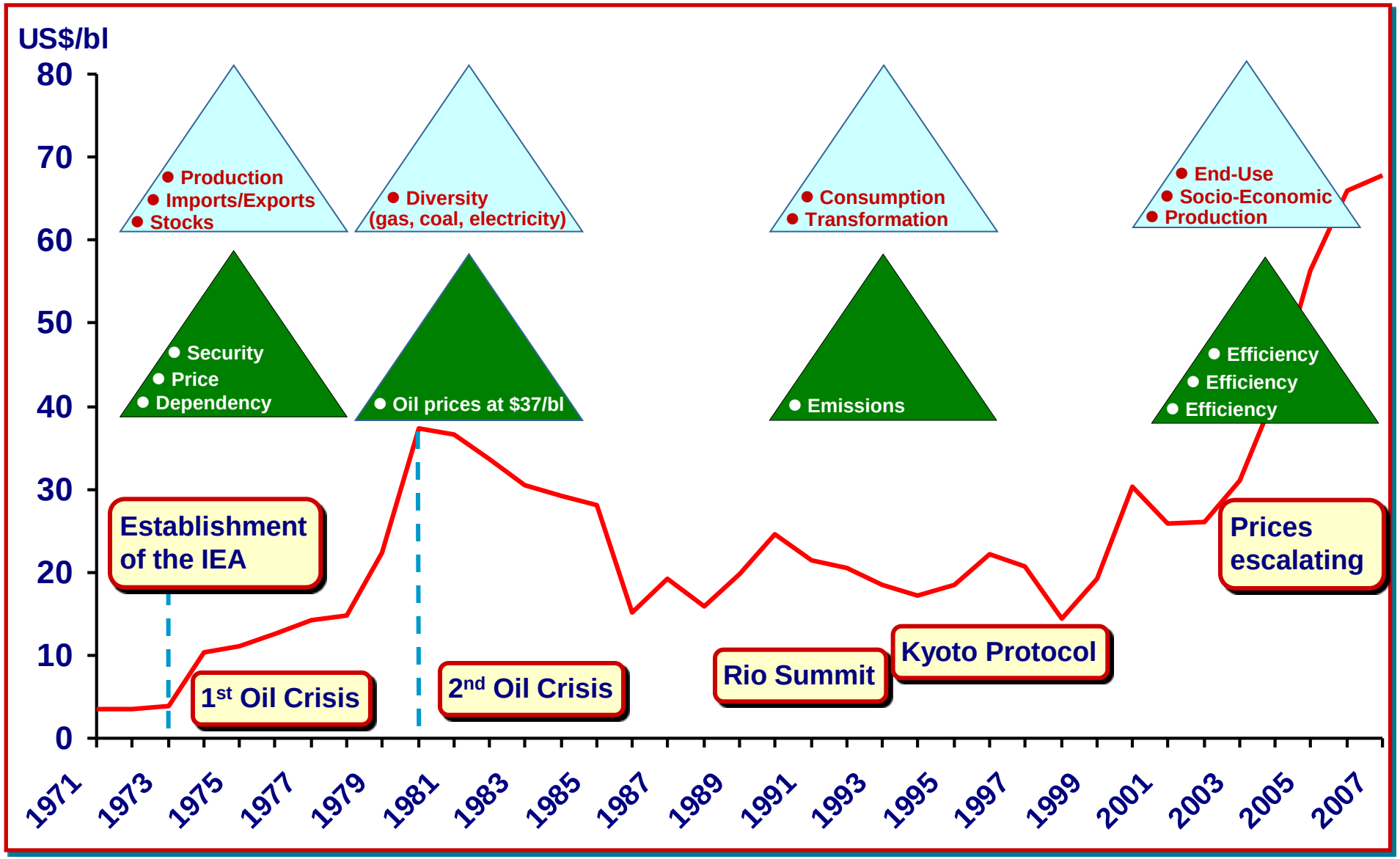


Member countries

- IEA
- OECD

- Autonomous Agency of the OECD
- Established in 1974 after 1st Oil Crisis
- 28 Members Countries (vs. 34 for OECD)
- 3 Es: Energy security, Economy and Environment

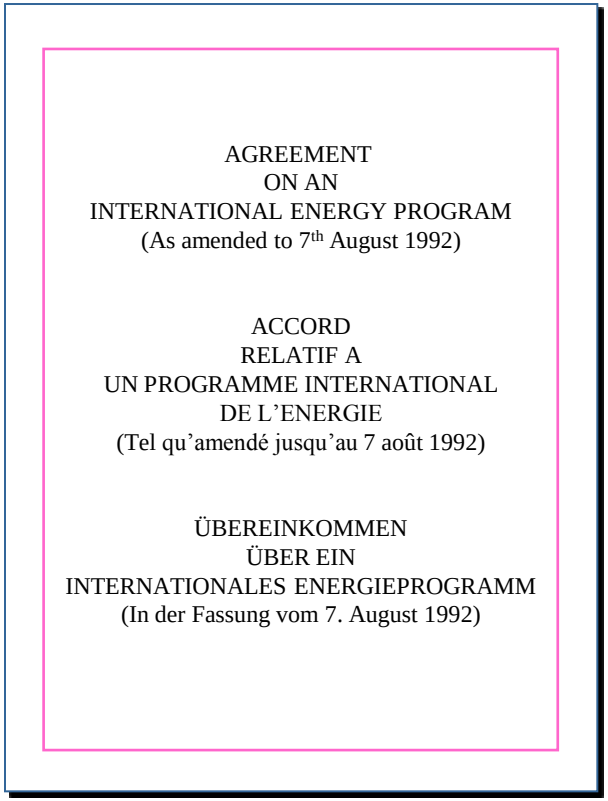
How IEA Statistics developed over time



A few Basic Principles for Establishing an Energy Information System

1. Do not collect statistics for the sake of collecting statistics but collect only statistics which are needed
2. Establish a legal basis
3. Establish a proper reporting mechanism:
   - Questionnaires (as user friendly as possible)
   - A network of focal points
   - An agreed timetable
4. Establish proper dissemination mechanism
5. Allocate proper resources to collect/process the data
6. Do not lock the system. Keep the system live in order to anticipate the evolution of the energy situation

Establish a Legal Basis



AGREEMENT
ON AN
INTERNATIONAL ENERGY PROGRAM
(As amended to 7th August 1992)

ACCORD
RELATIF A
UN PROGRAMME INTERNATIONAL
DE L'ENERGIE
(Tel qu'amendé jusqu'au 7 août 1992)

ÜBEREINKOMMEN
ÜBER EIN
INTERNATIONALES ENERGIEPROGRAMM
(In der Fassung vom 7. August 1992)

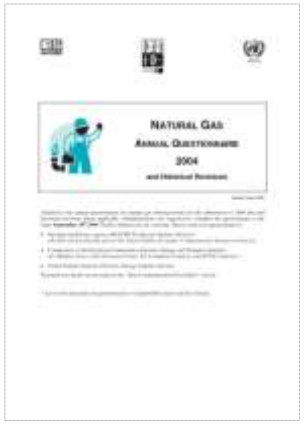
Decisions of Governing Board

+

Decisions of Specific Committees (Emergency preparedness, etc.)

Establish a proper reporting mechanism (OECD)

Five Annual Energy Questionnaires



Other Annual: Energy Forecast and R&D Budget for IEA

Quarterly Questionnaires: Prices and Taxes questionnaire

Monthly Questionnaires:

Monthly Oil and Gas Statistics, Joint Oil Data Initiative
Electricity production and trade

Exceptional Questionnaires: Mainly in case of oil crisis, or ad-hoc activities (e.g.: Non-Energy Use Network)

What flows are collected?

Production
Import
Export
International Marine Bunkers
Stock Changes
Domestic Supply

Transfers
Statistical Differences

Transformation Sector *(18 sub-sectors)*
Energy Sector *(16 sub-sectors)*
Distribution Losses

Final Consumption
- Industry Sector *(13 sub-sectors)*
- Transport *(7 sub-sectors)*
- Other Sectors *(4 sub-sectors)*
- Non Energy Uses

Electricity and Heat Outputs

TOTAL: 95 FLOWS

What products are collected?

- Coal (17 products/categories)
- Natural gas
- Crude Oil and Petroleum products (25 products)
- Nuclear Energy
- Hydro Energy
- Renewable Energy (19 products/categories)
- Waste Energy (3 products/categories)
- Electricity
- Heat (7 categories)
- TOTAL: over 75 products/categories

An agreed timetable

National Administrations

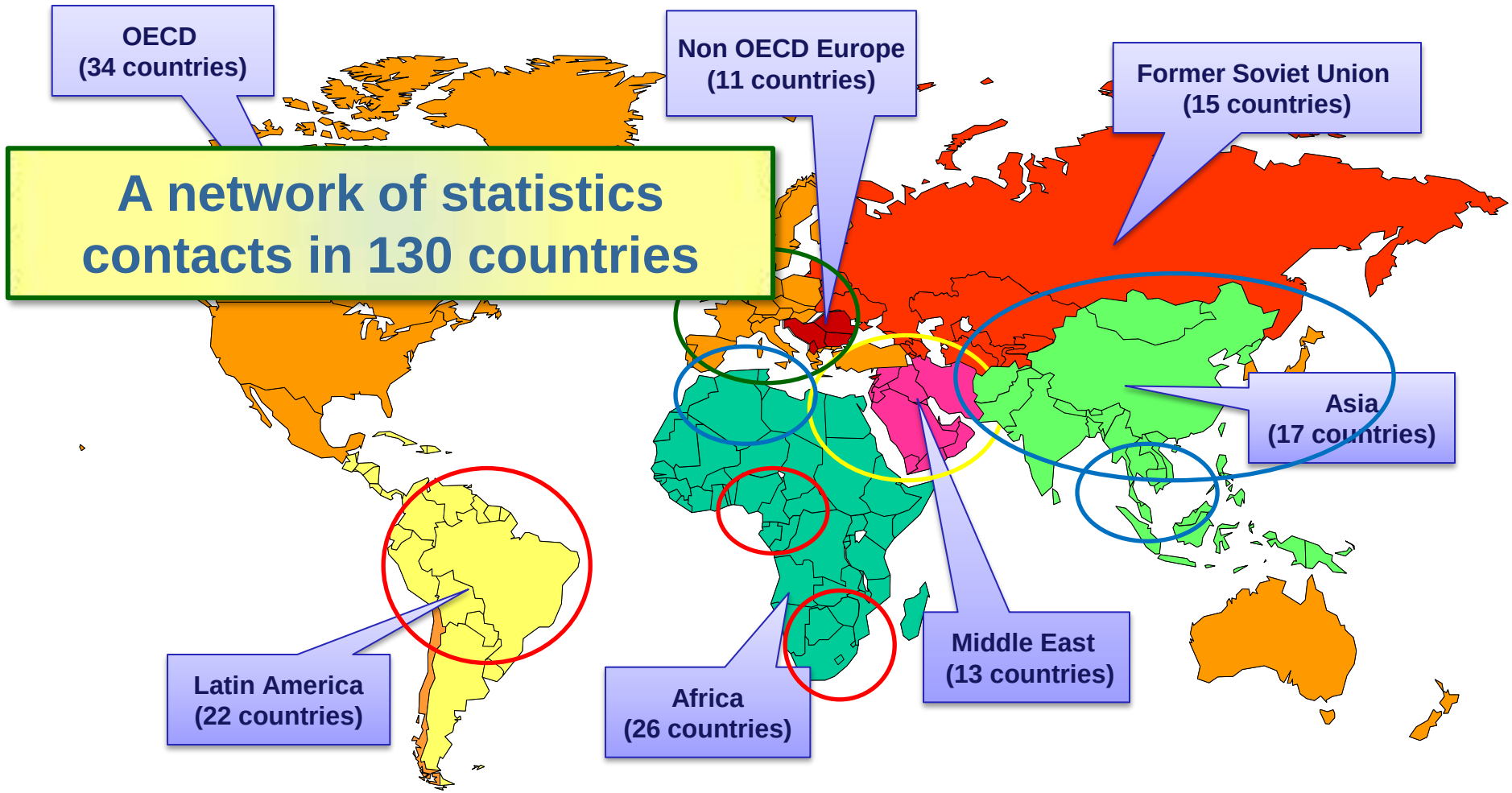
Prepared in June-July

Queries

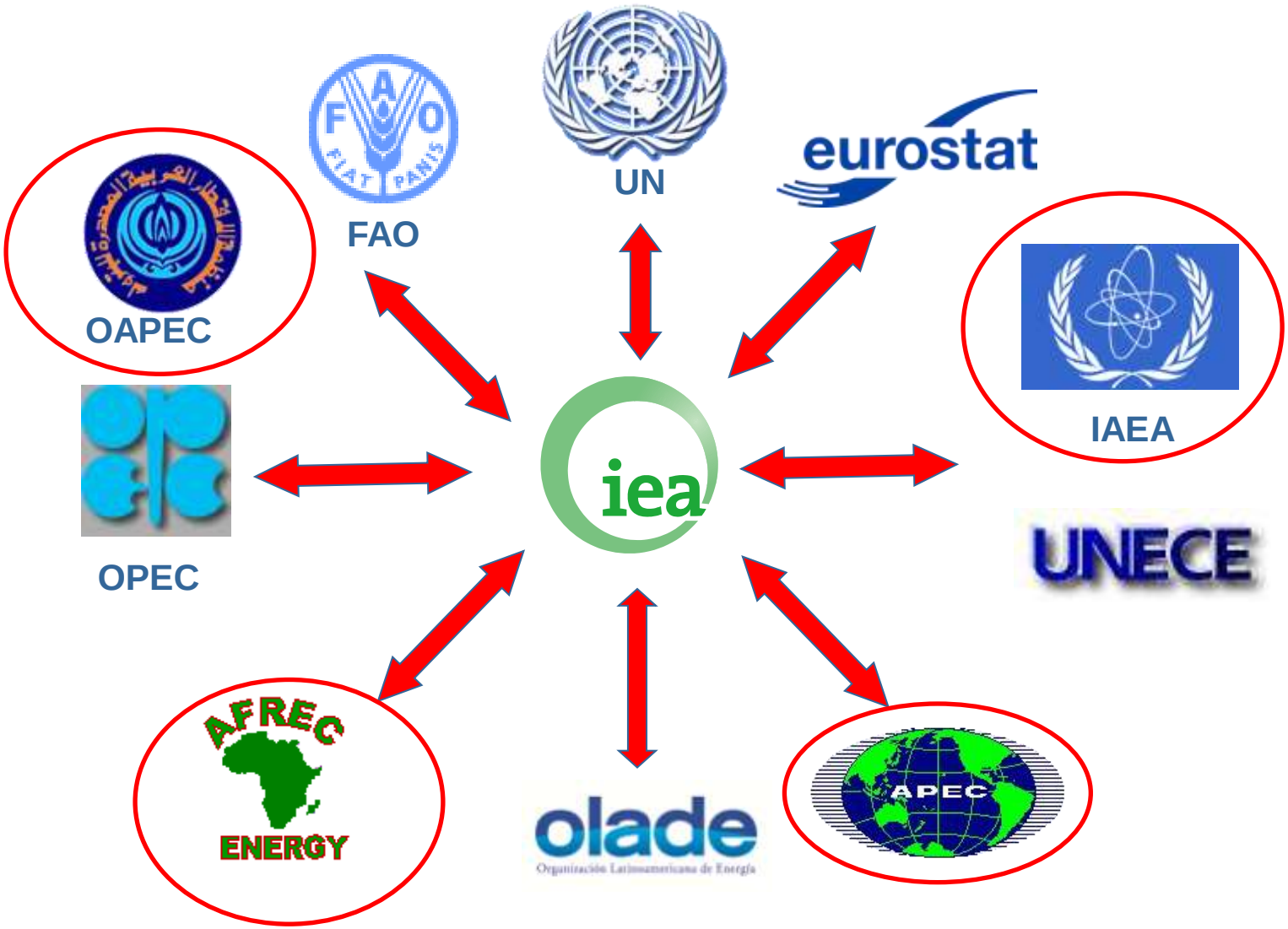
The annual OECD statistics cycle

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep
Questionnaires														
Processing														
Databases														
Publications and CD-ROMS												  		

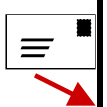
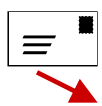
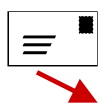
How non-OECD data are collected



How non-OECD data are collected (cont.)



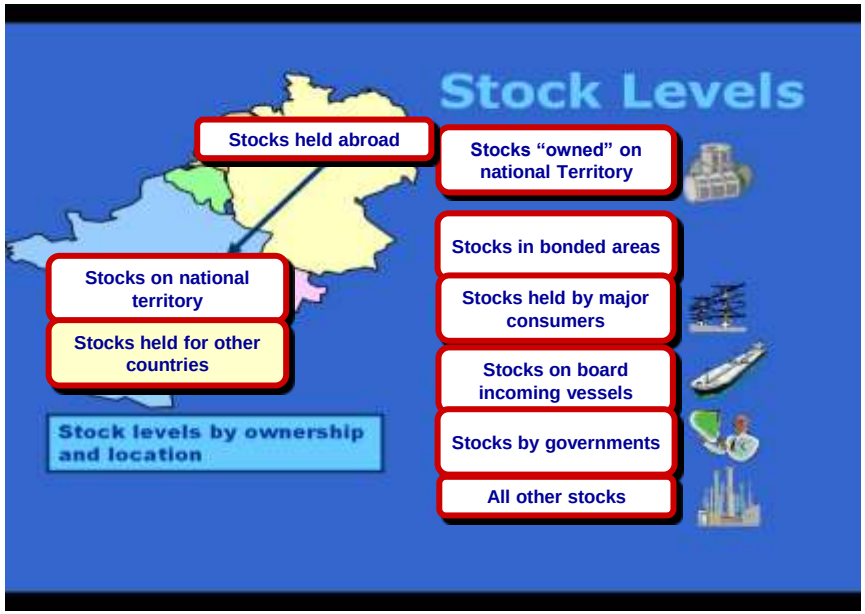
The annual non-OECD statistics cycle

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep
Questionnaires														
Processing														
Databases														
Publications and CD-ROMS								OECD		Non-OECD			 	 

For emergency and market analysis the IEA maintains an up-to-date oil database

Monthly Oil Questionnaire (MOS for M-2)

- Production
- Imports/Exports by Origin and destination
- Refinery data
- Deliveries
- Stock levels

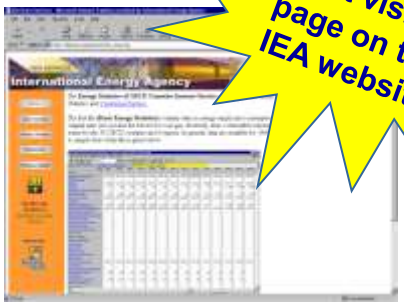


Establish a proper dissemination mechanism

Books

CDs

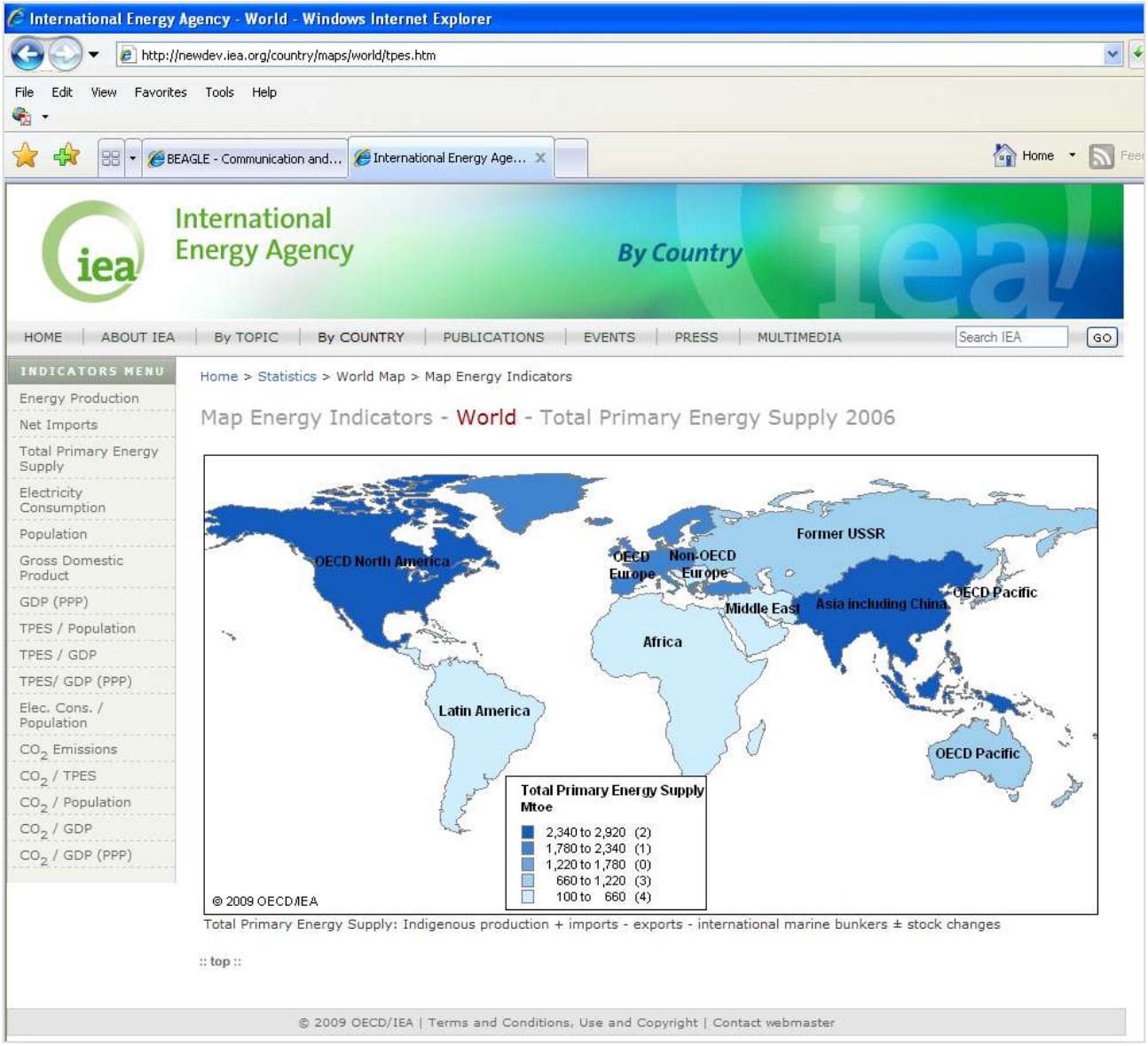
Internet



Most visited page on the IEA website

- Free access to Administrations
- Subscription for others
- Pay-per-view also available

Samples of free information available on the web



The IEA Statistics Page on the IEA Web Site

How are monthly oil data collected and released?

National Administrations

MODS

www.iea.org

Monthly Oil Survey

July 2004

Emergency Policy

MOS

M-2

25th

Oil Market Analysis

JODI

M-1
M-2

25th-1st

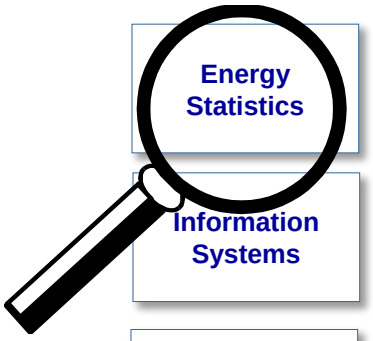
Global Database

APEC

eurostat

olade

Organisation of the International Energy Agency



Energy Statistics

Information Systems

Personnel & Finance

EXECUTIVE DIRECTOR
Special Assistant

DEPUTY EXECUTIVE DIRECTOR
Special Assistant

Communication & Information Office

Legal Counsel

Office of the Chief Economist

DIRECTORATE OF GLOBAL ENERGY DIALOGUE

- Europe, Middle East & Africa
- Asia Pacific & Latin America
- Country Studies
- Energy Technology Collaboration

DIRECTORATE OF ENERGY MARKETS AND SECURITY

- Energy Diversification
- Oil Industry & Markets
- Renewable Energy Unit
- Emergency Policy

DIRECTORATE OF SUSTAINABLE ENERGY POLICY & TECHNOLOGY

- Energy Efficiency & Environment
- Energy Technology Policy

Energy Data Centre
The "Heart" of the Agency

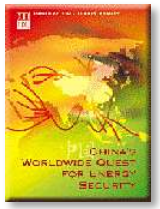
ENERGY MARKETS AND SECURITY

SUSTAINABLE ENERGY POLICY & TECHNOLOGY

Energy Data Centre

CHIEF ECONOMIST

GLOBAL ENERGY DIALOGUE



Allocate Proper Resources

The IEA Energy Data Centre

Head of Division

Desktop Publishing

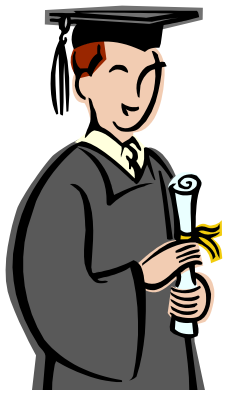
Secretariat

Oil and Natural Gas	Coal, Electricity and Renewables	Energy balances CO2 Emissions Prices and Taxes	Non OECD Member Countries
Monthly and Annual Oil and Gas Statistics	Quarterly Coal Monthly Electricity, Annual Electricity, Coal and Renewables Statistics **Energy Efficiency**	Annual Energy Balances, CO2 emissions Prices and Taxes	Annual Energy Statistics and Balances for Non-OECD countries

Problems encountered in energy statistics

- **Liberalisation of the market:**
  From one company to hundreds
- **Confidentiality (linked to liberalisation)**
- **More work passed to statistics offices:**
  - **More companies to survey (liberalisation)**
  - **Renewables (remote information)**
  - **Energy efficiency indicators (including socio-economic data)**
  - **Environment (estimation of GHG emissions, ….)**
  - **Etc.**
- **Resources do not follow work load:**
  Statistics still have a low profile, budget cuts
- **Fast turnover in staff** **perience, continuity**

The past situation in energy statistics offices



20s

30s

40s

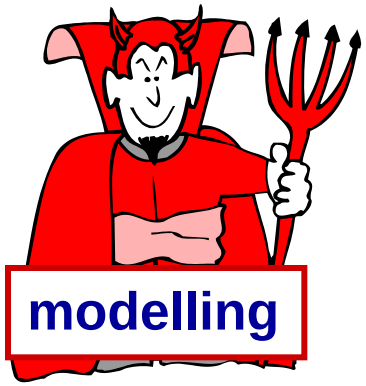
50s

Retirement age

gaining experience

passing experience

The current situation



modelling

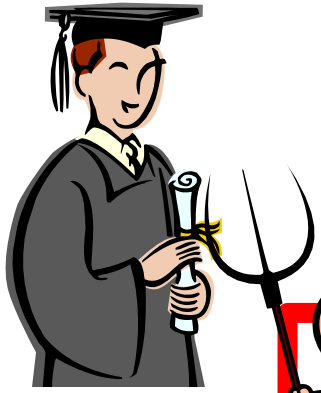
environment

private sector

Retirement age

50s

policy



20s

efficiency

- Temptation to move away from statistics is high
- Young statisticians only stay a few years
- Not enough time to have a full grasp of energy statistics
- No time to transmit their expertise

How the IEA tackles these problems

- Facilitating the work of newcomers in statistics:
  - Energy Statistics Manual
  - User-friendly electronic questionnaires
  - Training
- Raising the profile of energy statistics and the role of statisticians
  - Ministerial meetings
  - Governing Board Meetings
- Harmonisation and Cooperation

Facilitating the work of newcomers in statistics

A user-friendly manual to give necessary information to newcomers to understand/complete annual questionnaires

البترول

1 ما هو البترول؟

معلومات عامة

البترول هو مزيج معقد من الهيدروكربونات السائلة والمركبات الكيميائية التي تحتوي على الهيدروجين والكربون ويتكون بشكل طبيعي في خزانات في الصخور الرسوبية. ومصدر هذا المصطلح من اللغة اللاتينية من الكلمة "petra" والتي تعني الصخر والكلمة "oleum" والتي تعني النفط وتستخدم كلمة "oil" في الغالب بحيث تعني كلمة "petroleum". وبتوسيع تعريف هذه الكلمة نجد أنها تشمل المنتجات الأساسية "غير المكررة" والمنتجات الثانوية (المكررة).

وعملية توفير الإمداد بالنفط واستخدامه في الاقتصاديات الصناعية عملية معقدة وتتضمن استخدام الطاقة واستخدامات أخرى. ولذلك فإن مؤشرات الاستخدام التي نتناولها فيما يلي هي إرشادات فقط للممارسات العامة وليس قواعد صارمة يتم الالتزام بها. يقدم الملحق 1 شروحات كاملة

معلومات معينة مرتبطة بالاستبيان المشترك

يغطي استبيان البترول الزيوت المعالجة في معامل التكرير وفي المنتجات البترولية المصنعة منها. ويشمل الاستبيان أيضًا جميع مصادر الإمدادات واستخدامات الزيوت بالإضافة إلى قيمها السعرية.

الأساسية أو الزيوت الثانوية كزيت تغذية. بالإضافة إلى الغاز الطبيعي المسال وزيوت تغذية

معلومة أساسية

يذكر الاستبيان بيانات الزيت الخام بالألف طن متري. يجب أن تكون الأرقام أرقام صحيحة دون كسور عشرية.

الضروري أن تكون هناك قدرة على تحويلها إلى وحدة شائعة الاستخدام لأغراض المقارنة. تستخدم صناعة البترول على المستوى الدولي البرميل بشكل رئيس كوحدة مرجعية. وبالنسبة لبعض التدفقات البترولية مثل الإنتاج والطلب على البترول يشيع استخدام الوحدة عدد البراميل في اليوم.

وكما ذكر من قبل ففي حالة التحويل من الكتلة إلى الحجم والعكس يجب معرفة الوزن النوعي والكثافة النوعية للخام. ودون الدخول في التفاصيل الفنية باستفاضة يجب شرح بعض المصطلحات القليلة من أجل فهم عوامل تحويل الخام.

تعرف الكثافة على أنها الكتلة لكل وحدة حجم، على سبيل المثال الطن لكل برميل. أما الوزن النوعي فهو الوزن النسبي لكل وحدة حجم (أو كثافة) لمادة معينة بالمقارنة بوحدة حجم الماء. وتبلغ كثافة الماء 1 جم كل سم مكعب. فمثلاً بنزين السيارات له كثافة أقل لأنه أخف إذا كان له نفس الحجم. ولذلك يكون الثقل النوعي لبنزين السيارات أقل من 1. ونظرًا لأن الحجم يتغير مع حدوث تغير في درجة الحرارة فإن البيانات المتعلقة الوزن النوعي تذكر مع مرجع إلى درجة حرارة معينة (بالنسبة للبترول فإن المرجع يكون عادةً 15 درجة مئوية). علاوة على ذلك فإن الوزن النوعي يذكر على أنه نسبة مئوية فعلى سبيل المثال فإن الثقل النوعي 0.89 يذكر على أنه 89.

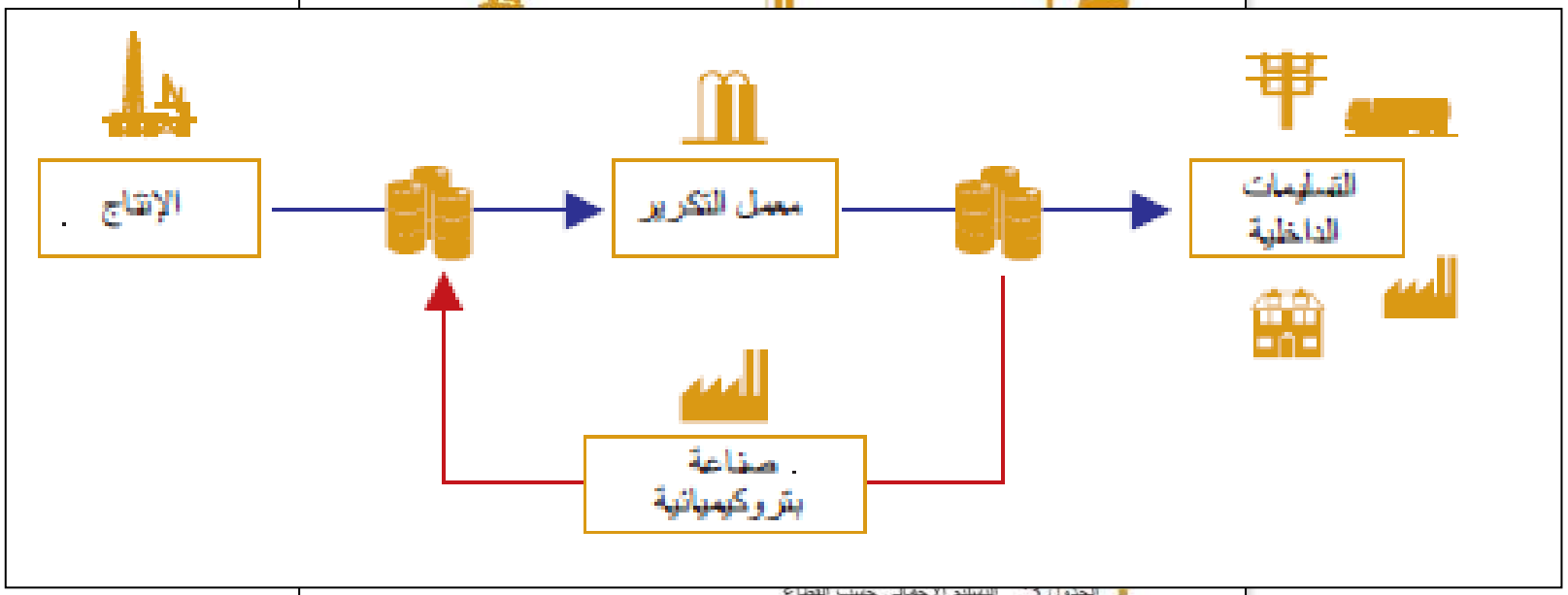
أما مصطلح ثقل معهد البترول الأمريكي (API) (معيار يستخدمه معهد البترول الأمريكي) فهو مصطلح شائع الاستخدام للتعبير عن الثقل النوعي للبترول.

ملاحظة: يعرف ثقل معهد البترول الأمريكي على أنه: 141.5 / 60 ثقل نوعي في درجة حرارة 60 درجة فهرنيت) – 131.5.

والنتيجة هي مقياس اجتهادي لقياس الثقل معبر عنه بدرجات معهد البترول الأمريكي حيث يكون المركب الأخف هو الأعلى في درجة الثقل لمقياس معهد البترول الأمريكي. فالخامات التي تعتبر خامات خفيفة؛ على سبيل المثال هي التي تكون بشكل عام أكبر من 38 درجة بمقياس معهد البترول الأمريكي بينما الخامات التي أقل من 22 درجة بمقياس معهد البترول الأمريكي تعتبر من زيت الخام الثقيل.

ويتحرك الوزن النوعي وثقل معهد البترول الأمريكي في اتجاهين متعاكسين. ويتحرك ثقل معهد البترول الأمريكي في نفس اتجاه محتوى الطاقة لكل طن، على سبيل المثال كلما ارتفع ثقل معهد

الصورة 4.1 • جدول انسيابي مبسّط حول النفط



- الجدول 3: التسليم الإجمالي حسب القطاع
- الجدول 4: عمليات الاستيراد حسب (بلد المنشأ)
- الجدول 5: عمليات التصدير حسب (بلد الوجهة)
- الجدول 6: مدخلات جهات الإنتاج الذاتي لتوليد الكهرباء والحرارة

من الضروري جمع الأرقام الموجودة في التقرير بشكل صحيح وأن يكون هناك اتساق بين الاجماليات التي ترتبط بعلاقات منطقية مع بعضها البعض والموجودة في جداول مختلفة. وعلاقات الجدول هذه موضحة في المخطط التالي:

يجب أن تكون القيم الإجمالية التالية متسقة في الجداول المختلفة:

- يجب أن تتطابق المنتجات المنقولة كزيوت تغذية لمعامل التكرير في الجدول 1 مع المنتجات المنقولة الإجمالية في الجدول 2أ. يجب أن يتطابق الاستخدام المباشر في الجدول 1 مع إجمالي إيصالات المنتجات الأساسية في الجدول 2أ.
- يجب جمع الواردات حسب المنشأ في الجدول 4 ويذكر المجموع ضمن الواردات الإجمالية في الجدول 1 والجدول 2أ.
- يجب جمع الصادرات حسب الوجهة في الجدول 5 ويذكر المجموع ضمن الصادرات الإجمالية في الجدول 1 والجدول 2أ.

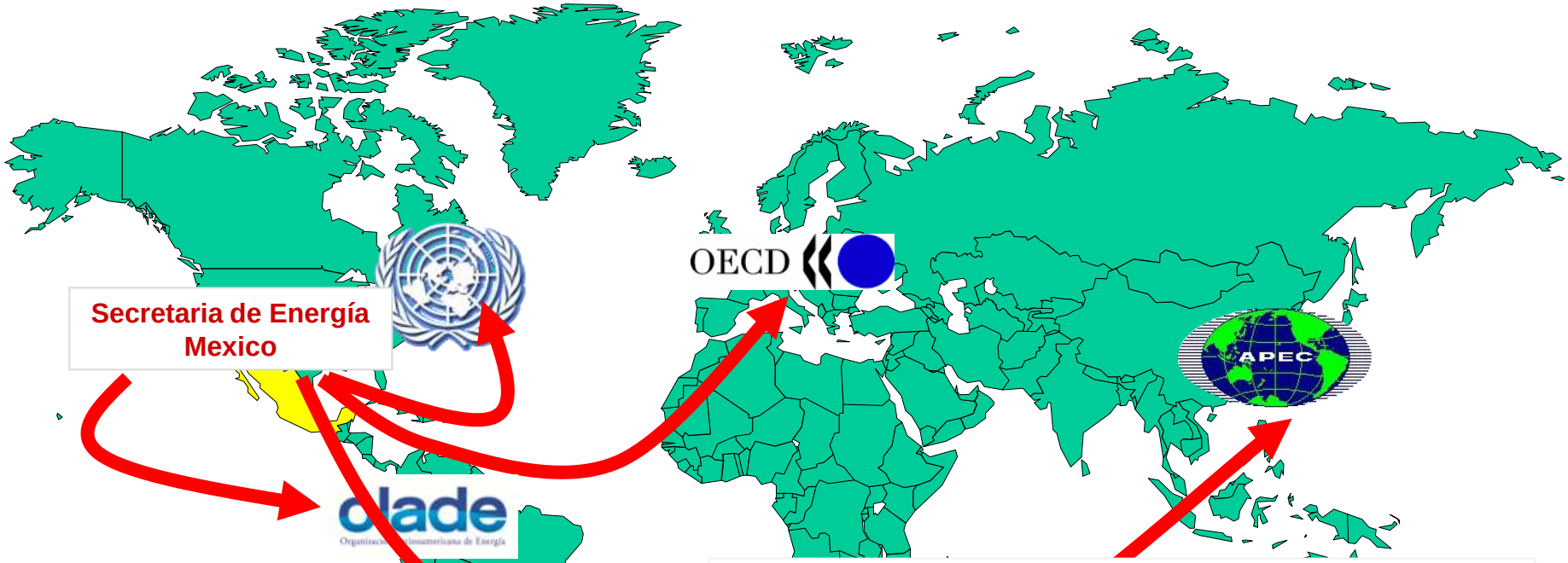
What does the IEA do to help countries improve their statistics (1)

The Manual is now available in 10 languages and widely used all around the world

How the IEA tackles these problems

- **Facilitating the work of newcomers in statistics:**
  - Energy Statistics Manual
  - User-friendly electronic questionnaires
  - Training
- **Harmonisation and Cooperation**
- **Raising the profile of energy statistics and the role of statisticians**
  - Ministerial meetings
  - Governing Board Meetings

Harmonisation and Cooperation



Crude Oil Production for Mexico (in kbd)

	1995	1996	1997	1998
APEC	2653	2903	3087	3134
IEA	2741	2872	3062	3109
OLADE	2722	2969	3022	3070
OPEC	2618	2858	3022	3071
UN	2834	2977	3166	3210

5% gap

JODI: The key to success: cooperation between countries, organisations and companies

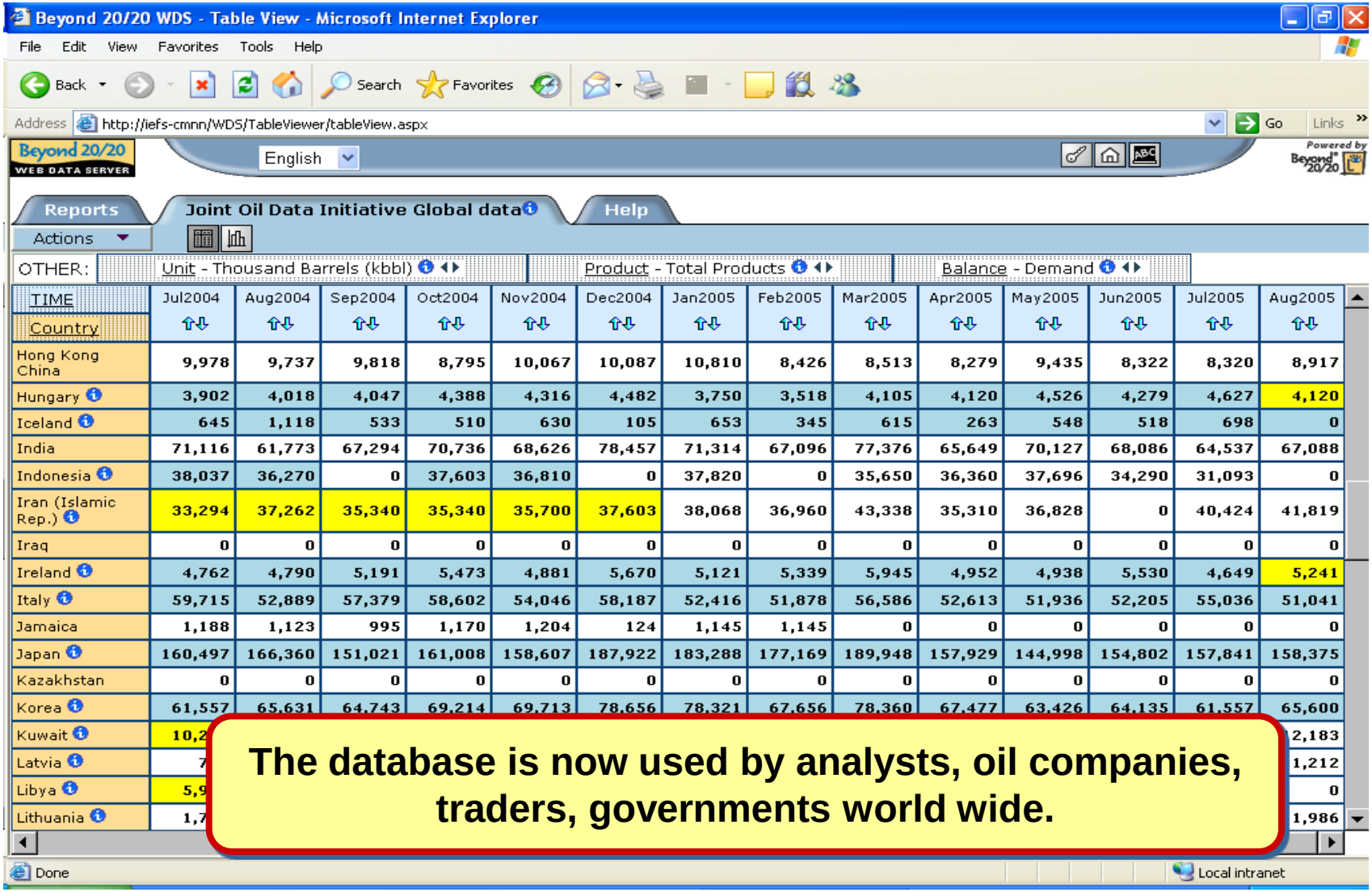
Russia
Indonesia
Netherlands
Germany
France
PR of China
APEC
Philippines
UK
EUROSTAT
Denmark
Belgium
Egypt
Gabon
Japan
UN
IEA/ OECD
India
Norway
South Africa
US
Canada
Saudi Arabia
OPEC
Libya
Brazil
OLADE
Mexico
Australia
Kuwait
Iran
Nigeria
Venezuela
Colombia
Argentina

3rd JODI Conference

Mexico, 23-25 May 2002

PetroVietnam
Kuwait Petroleum Co.
Petrobras
Statoil
Saudi Aramco
Petronas
Shell
Ecopetrol
TotalFinaElf

The JODI database is open to all and updated every month



The database is now used by analysts, oil companies, traders, governments world wide.

JODI: a need to adapt to a new reality

Joint Oil Data Initiative

Organisations: APEC, Eurostat, IEF, IEA, OLADE, OPEC, UNSD, (GECF for gas)

InterEnerStat
International Energy Statistics

Strengthening Harmonisation and Cooperation

2nd InterEnerStat Workshop, 19-20 November 2007, IEA, Paris

- 21 international/regional organisations
- Both data providers and users
- Harmonisation of definitions
- Common training sessions
- A joint website

Agreement on harmonised definitions reached at the end of 2010

UN Statistics Commission decided to use InterEnerStat definitions as the basis for IRES

InterEnerStat

Harmonisation of Definitions
of Energy Products and Flows

SECOND REVISION OF THE DEFINITIONS
Part 1: Flows

IEA, Paris, 20 September 2009

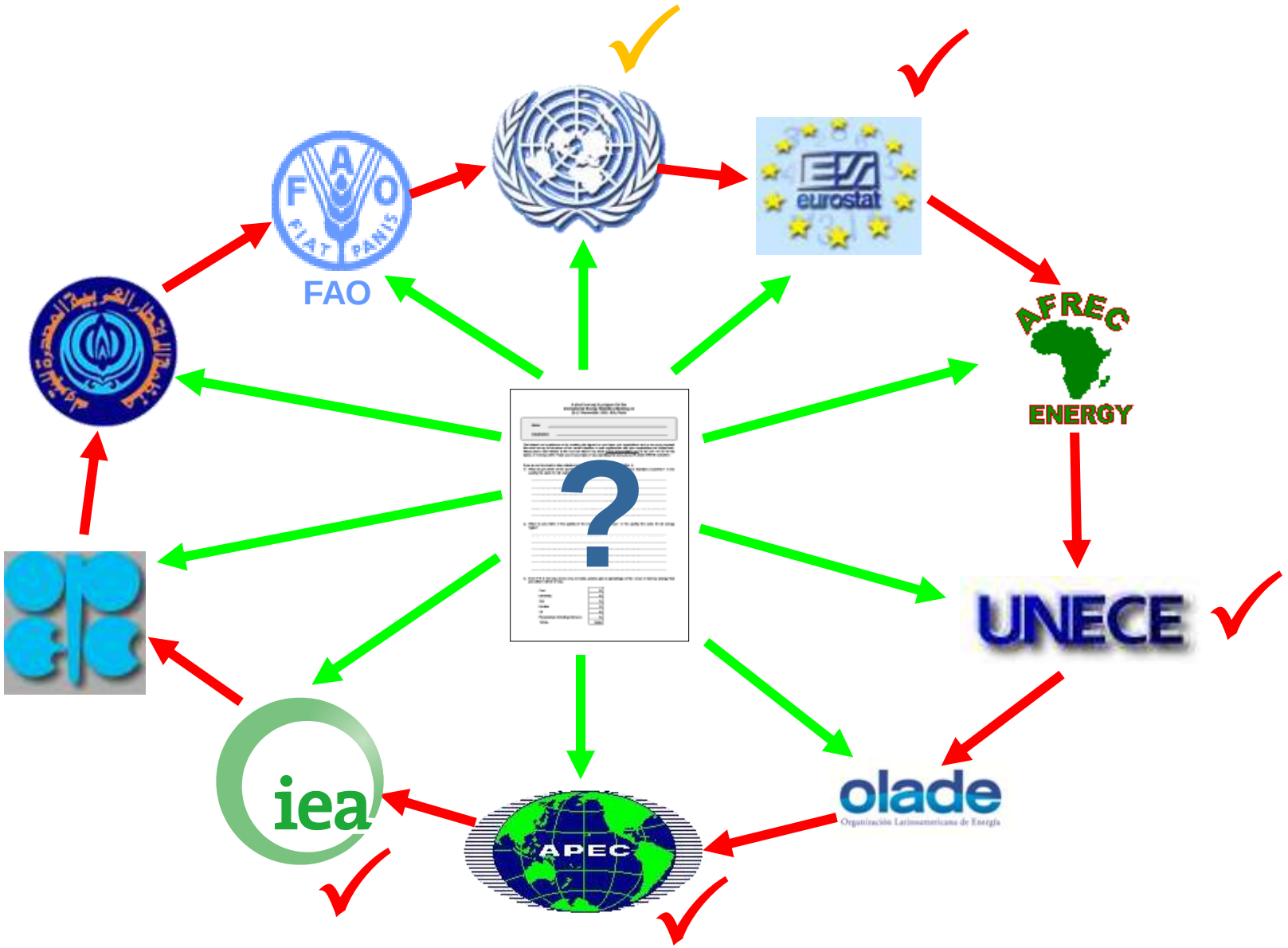
InterEnerStat

Harmonisation of Definitions
of Energy Products and Flows

SECOND REVISION OF THE DEFINITIONS
Part 2: Products

IEA, Paris, 20 September 2009

So, one questionnaire to all, dream or reality ?



How the IEA tackles these problems

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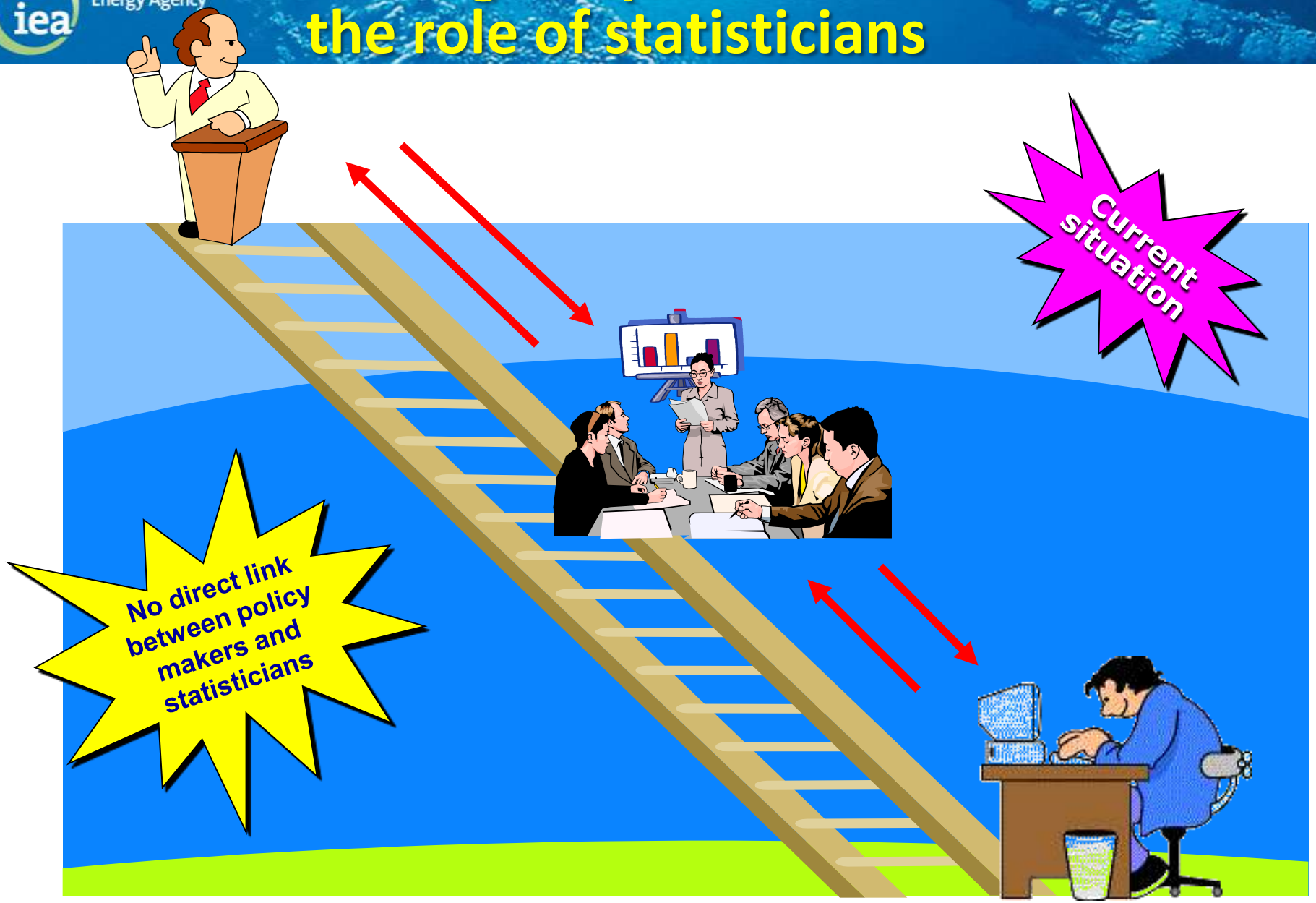
Raising the profile of statistics and the role of statisticians



In fact, the relationship between policy makers, analysts and statisticians should be more based on a 3-way street

Decision makers

- Need the right data immediately
- Allocation of resources

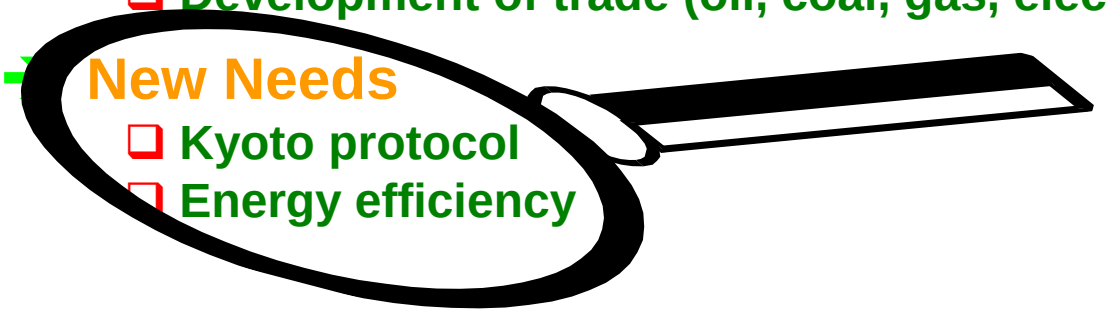
- The ones who do the work
- Should be fully involved in the whole process
  - ➔ Statisticians need to understand why they collect the data
  - ➔ Policy makers need to understand the problems faced by statisticians

- Prime users of the data
- Advisors to policy makers
- Interface between policy makers and statisticians
  - ➔ Lobby
  - ➔ Comments on data

On 19 November 2005, an example of how the profile of statistics can be raised is the launch of the JODI Database by King Abdullah

Do not lock the system. Keep the system live to anticipate the evolution of the energy situation

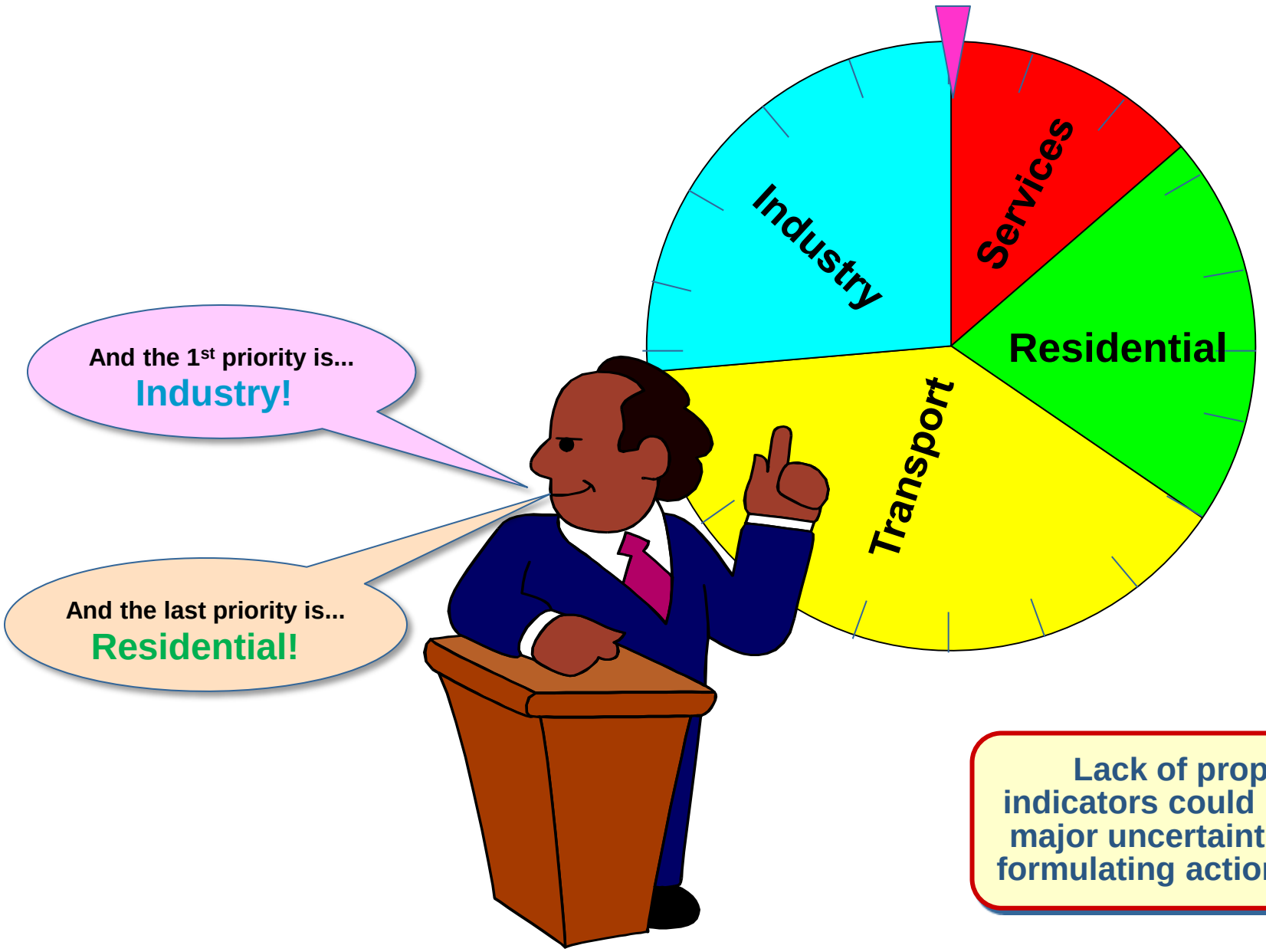
- There are constant changes in the energy sector
  - ➔ New products
    - ❑ Orimulsion
    - ❑ Oil shale, tar sands
    - ❑ LNG
    - ❑ Ethanol
  - ➔ New forms of energy
    - ❑ Wind
    - ❑ Photovoltaic
    - ❑ Hydrogen
  - ➔ New players
    - ❑ Liberalisation
    - ❑ Development of trade (oil, coal, gas, electricity)
  - ➔ New Needs
    - ❑ Kyoto protocol
    - ❑ Energy efficiency



Energy efficiency is on top of the energy agenda of many countries

- Saving energy in all sectors:
  - Residential
  - Transports
  - Industry
  - Services
  - Electricity generation
- Increasing exports - reducing imports
- Increasing domestic (and global) energy security
- Strengthening RD&D
- Creating jobs
- Reducing greenhouse gas (mainly CO_2) emissions

Energy efficiency is becoming a priority, but in many cases there is no data to launch sound energy efficiency policy and actions



Lack of proper indicators could lead to major uncertainties for formulating action plans

The other extreme would be to have too many data

… but it would be a much easier situation!

What data for what indicators

Aggregated Indicators

TPES/GDP

TPES/Production

Electricity Cons./Population

CO2/GDP PPP

Efficiency Elec. Prod.

Disaggregated Indicators

Cons./ton cement

Heating Cons./sqm/DD

Litre/100km (stock)

Process Efficiency

Dry process

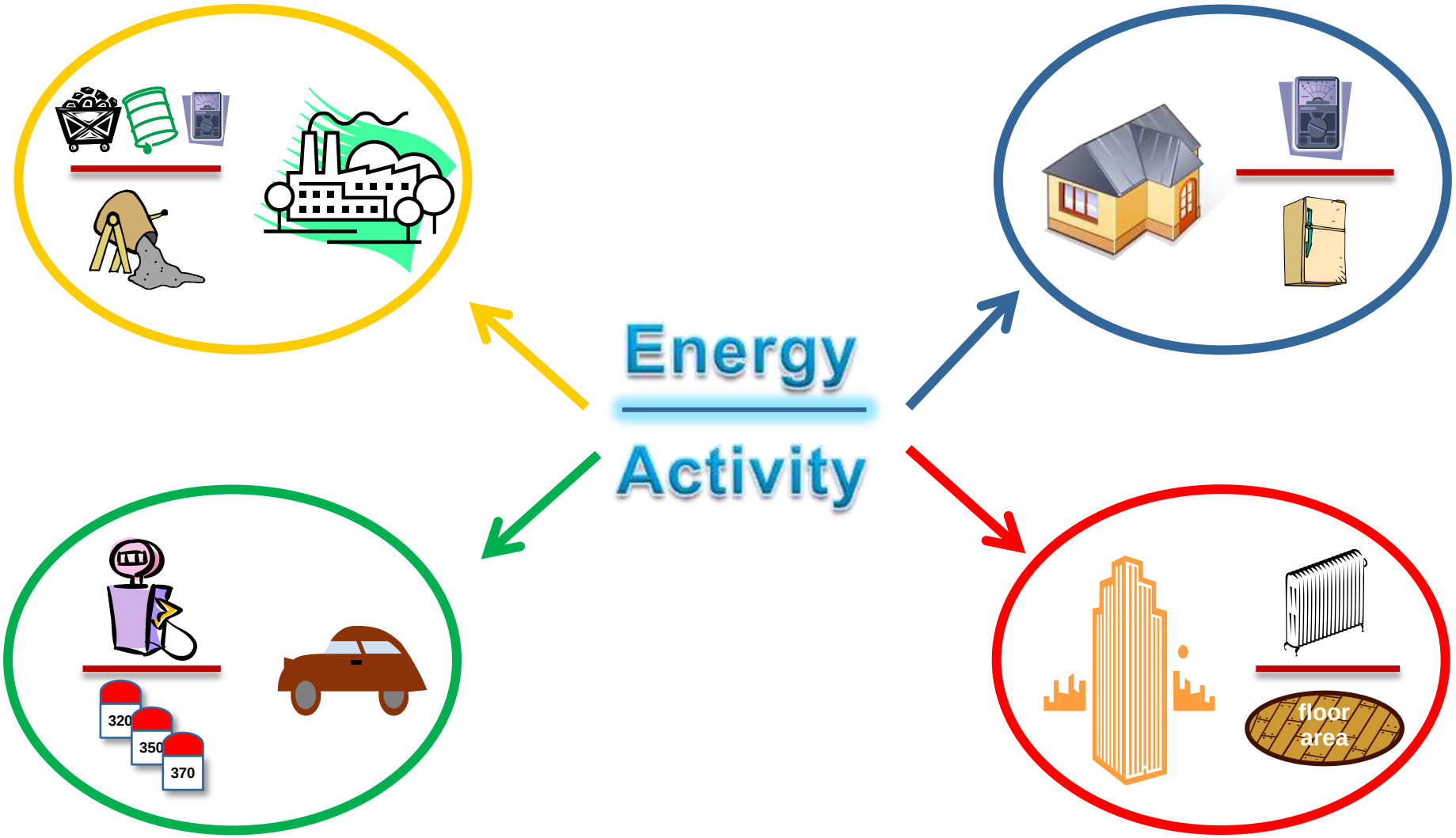
Condensing boiler

Litre/100km (vintage)

The Indicator Pyramid

The first step will be mainly limited to the data needed to build the disaggregated indicators

What data for what indicators?



Not only energy data, but also activity data are necessary.

In order to collect the data for building indicators the IEA has designed a new annual questionnaire

Draft Energy Efficiency Indicators Template

country name

COUNTRY DATA SECTION (to be reviewed and updated)	
MACRO ECONOMIC DATA	Macro economic and activity data
COMMODITIES	Production outputs from selected energy-consuming industries
INDUSTRY	Energy consumption by ISIC categories
SERVICES	Energy consumption by end-uses in the services sector
RESIDENTIAL	Household energy consumption by end-uses and selected appliances data
TRANSPORT	Energy and activity data for passenger and freight transport
IEA DATA and AGGREGATE INDICATORS	
ELECTRICITY GENERATION	Electricity generation from combustible fuels and efficiencies
BASIC INDICATORS	Predetermined set of aggregate energy and activity indicators
SUPPORT TOOLS	
USER REMARKS	To incorporate comments associated to the data from the individual sheets
DATA COVERAGE	Generates a graphical summary of data coverage (completed vs. expected)
SINGLE INDICATOR GRAPHS	To generate a graph for one energy indicator
MULTIPLE INDICATORS GRAPHS	To generate a graph comparing trends from multiple indicators
CONSISTENCY CHECKS	To run the integrated consistency checks

A few words to conclude

- Energy statistics are the basis for any sound energy policy. As a consequence, it is essential to allocate proper resources to collect the necessary data for monitoring and planning
- You don't build reliable statistics overnight. It takes time, effort, regulation/law, resources, …
- It took 35+ years for the IEA to establish its statistics but it is a never ending process since we are constantly expending coverage and struggling for improving quality
- Harmonisation and cooperation are two key words to improve quality and coverage of energy statistics
- The IEA is extremely committed to strengthen cooperation with OECD and non-OECD countries as well as with regional and international organisations
- This is the reason why we are delighted to be with you for the next five days in order for us to better understand strengths and weaknesses of energy statistics in your respective countries and for sharing our own experience of international energy statistics.
- It is our sincere hope that this workshop will further strengthen the relationship between you and us, and between your countri… th… International Energy Agency.

Thank you