Environmental Management in Utilities in the European Union

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0. Content

1. Importance of Environmental Management („EnMan“) for companies (specially for utilities) international (EU) dimension and legal frame
2. What are the facts in the utilities‘ policies?
3. University research/teaching (models), EnMan legislation, EMAS and ISO standards, training
4. Conclusions

1.1 Growing importance for EnMan: three major events

1. Raising awareness of Climate Protection:

   adoption of the Kyoto Protocol (setting GHG emission targets), EU legislation (directives, regulations, decisions,...)

2. Liberalisation of EU Energy Markets:

   Utilities need now to integrate environmental costs in market prices

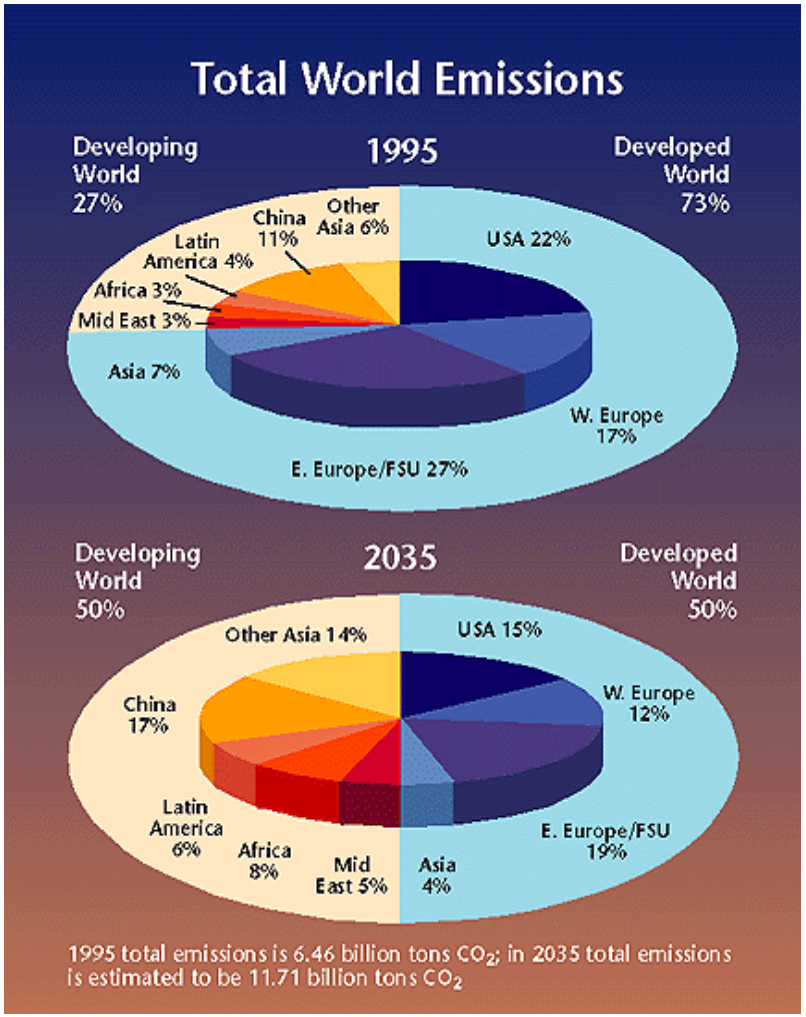
3. Czech Republic (+ other CEC) joining the EU

1.2 International dimension: Kyoto Protocol (UNFCCC “Rio” 1992)

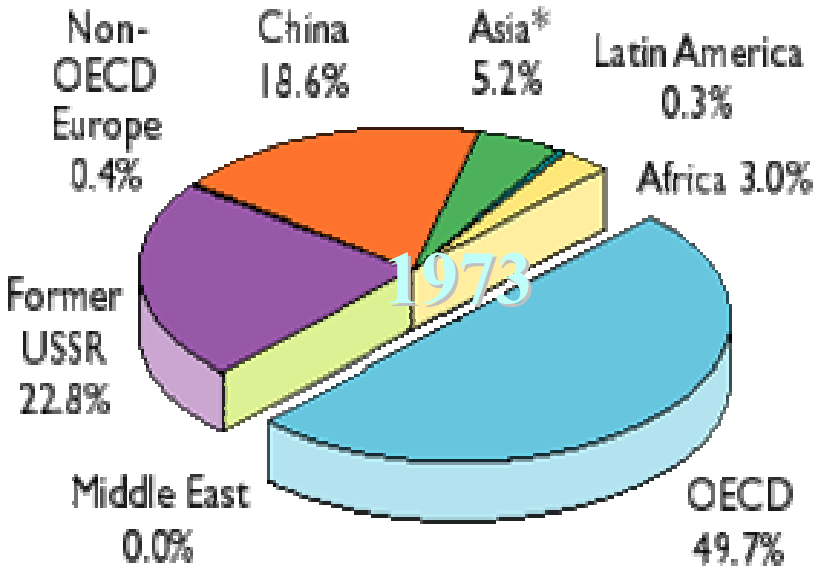
- Ratification now, in force by next March
- Some ind. countries commit to GHG-ER (5%)
- “Domestic” measures: fiscal measures, standards, incentives, RTD, cutting aid, voluntary agreements etc., mainly by national policy; sinks (!)
- Flexible mechanisms (international) :
  - GHG Emissions Allowance Trading (“EAT”),
  - Int. investments in cost efficient CO_2 reducing projects through Joint Implementation (“JI”) and Clean Development Mechanism (“CDM”)

1.3 World CO_2 emissions

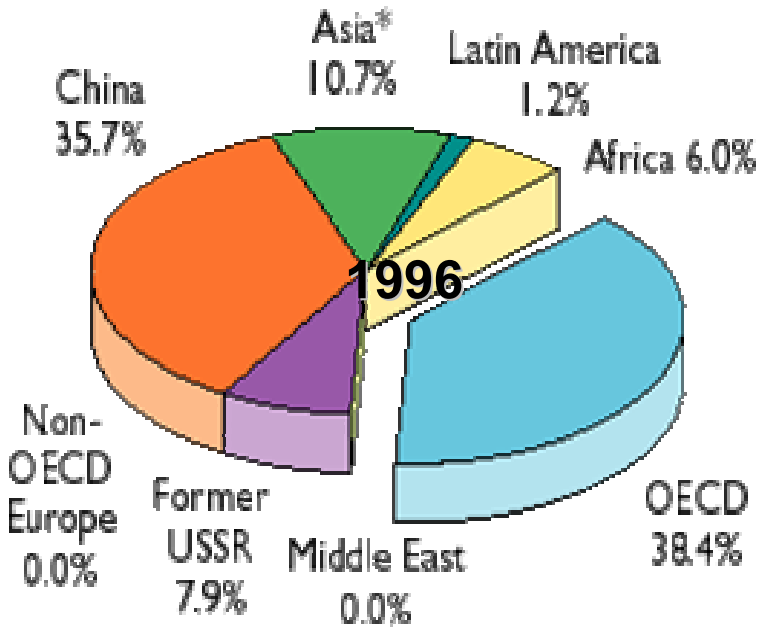
- **In 1995, 73 percent of the total CO_2 emissions from human activities came from the ind. Countries;**
- **The US largest pollutor, accounting for 22 percent of the total, with carbon emissions per person now exceeding 5 tons per year;**
- **Energy use of DCs only 1/10 to 1/20 of the US level will strongly increase.**



1.4 Development of CO_2 Emissions* worldwide



16 200 Mt of CO_2



22 700 Mt of CO_2

*Calculated using IEA's Energy Balance Tables and the Revised 1996 IPCC Guidelines.
CO2 emissions are from fuel combustion only.

1.5 Energy consumption in the EU_{25}

Gross inland consumption (1.654 Mtoe) in 2000

– oil	635	38,4%
– gas	373	22,6%
– coal	306	18,5%
– nuclear	238	14,4%
– RES and others	102	6,2%

NB Heavy impact on CO_2 emissions: about 4 bt/y
NB Thermal conventional electricity production 80%!

Source: EU Statstical pocket book 2003

1.6 Environmental impact of energy use in the EU_{15}: GHG emissions 2001

- GHG-Emissions: total 3.080 Mt CO_2 for an energy consumption of 1.455 Mtoe
- Share of GHG in the EU-15 today
  - CO_2 80% - CH_4 15%
  - N_2O 4% - other 3 fluorinated gases 1%

But over 100y period reverse importance!

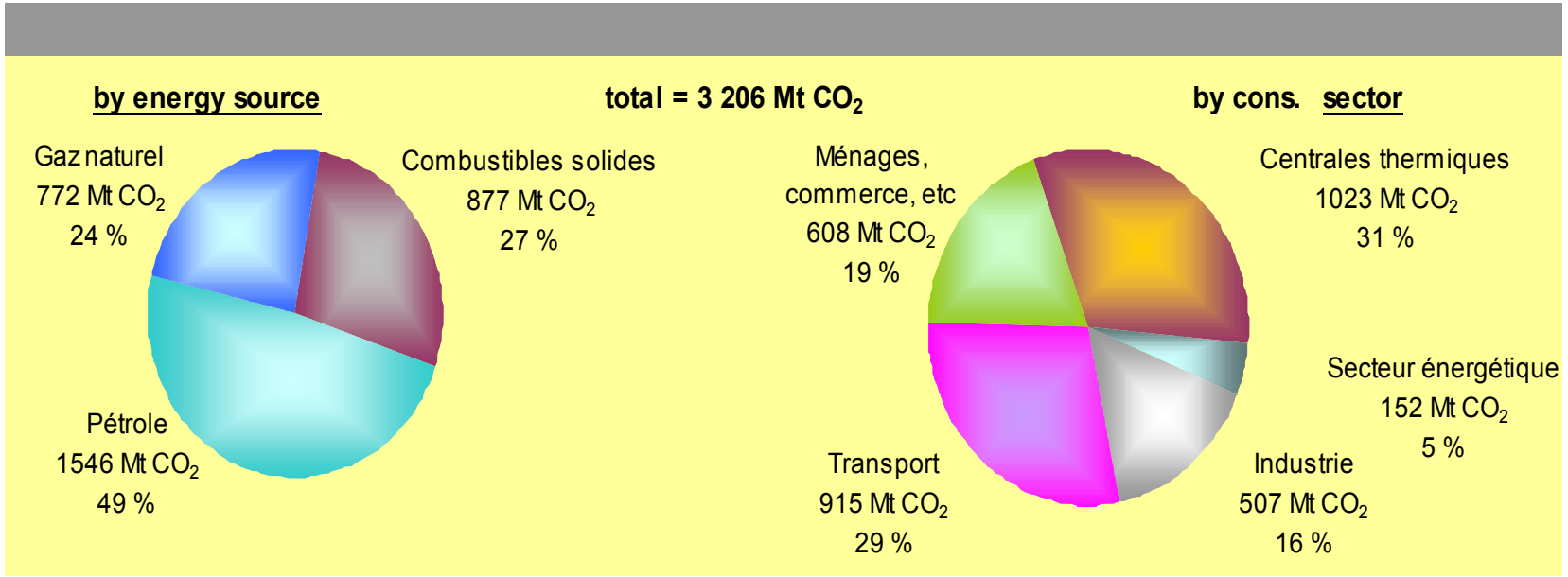
Ref. to annex 3 and 4: factors 1:21:310:8.000-24.000

1.7 CO_2-Emissions by sector EU_{15}

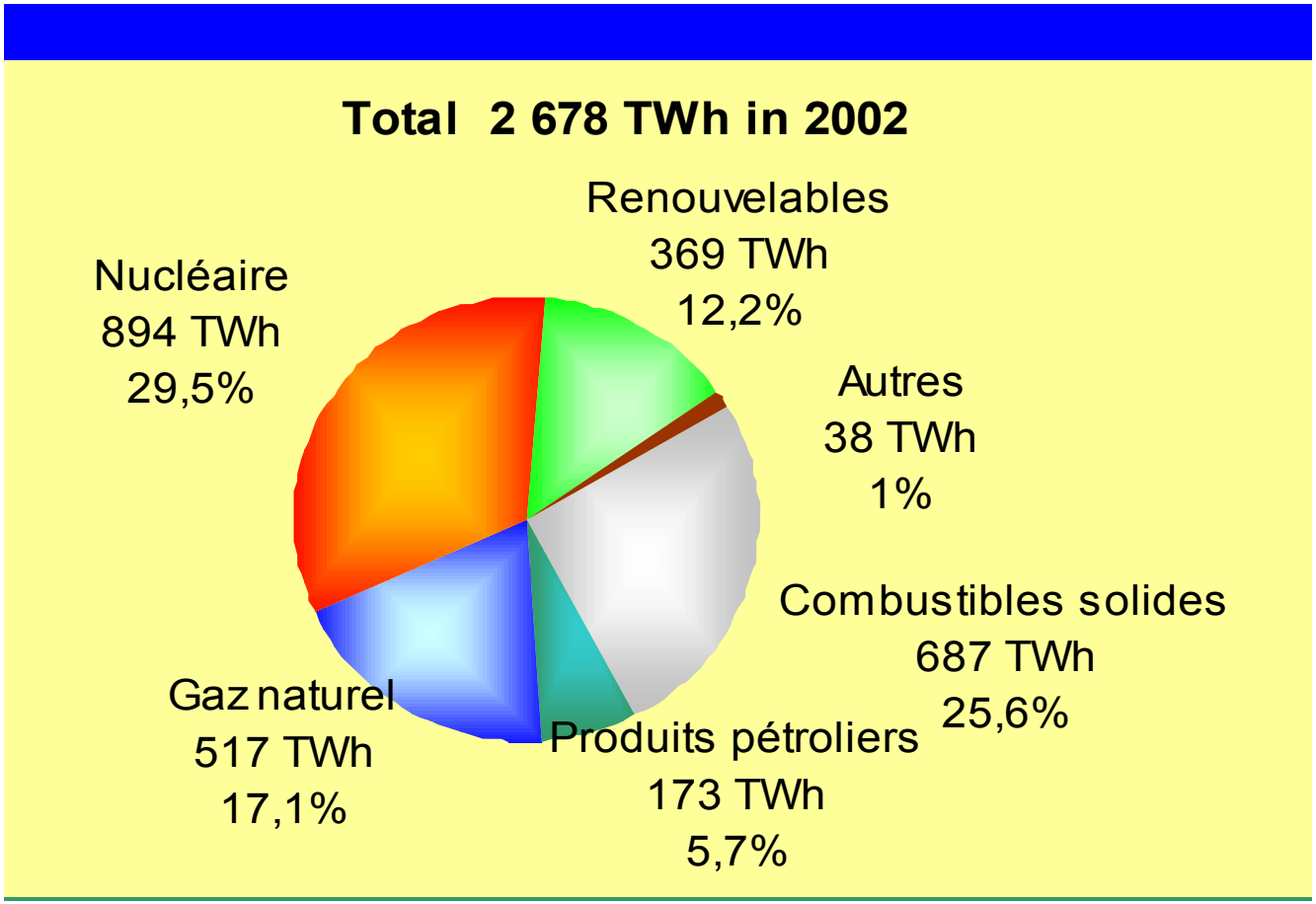
	2001	*2010*
• Electricity-, heat production	1.213 Mt CO_2	+ *2%*
• Transport	738 "	+ *39%*
• Domestic, other services	642 "	+ *12%*
• Industry	430 "	+ *4%*
• Others	57 "	- *15%*
All sectors	3.080 Mt CO_2	+8%

US 4.930 or 20/capita Japan 967 or 7/c, Russia 2.138 or 14/c; EU 8/c

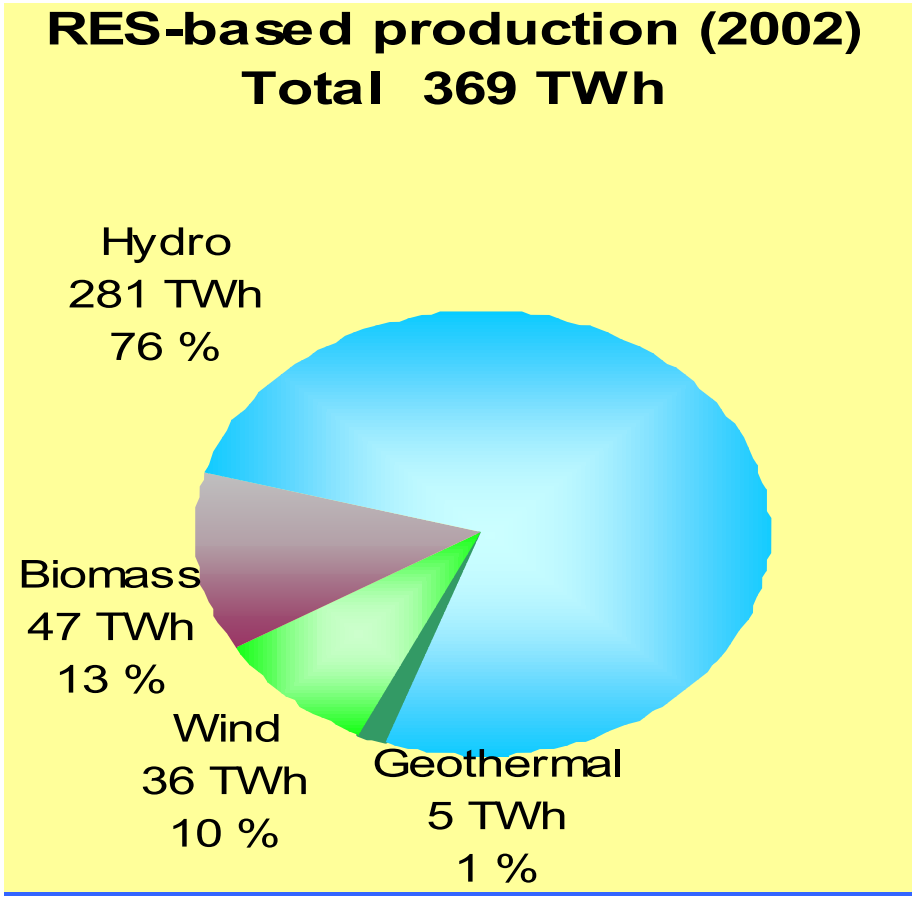
1.8 CO_2-Emissions in the EU_{15} in 2002



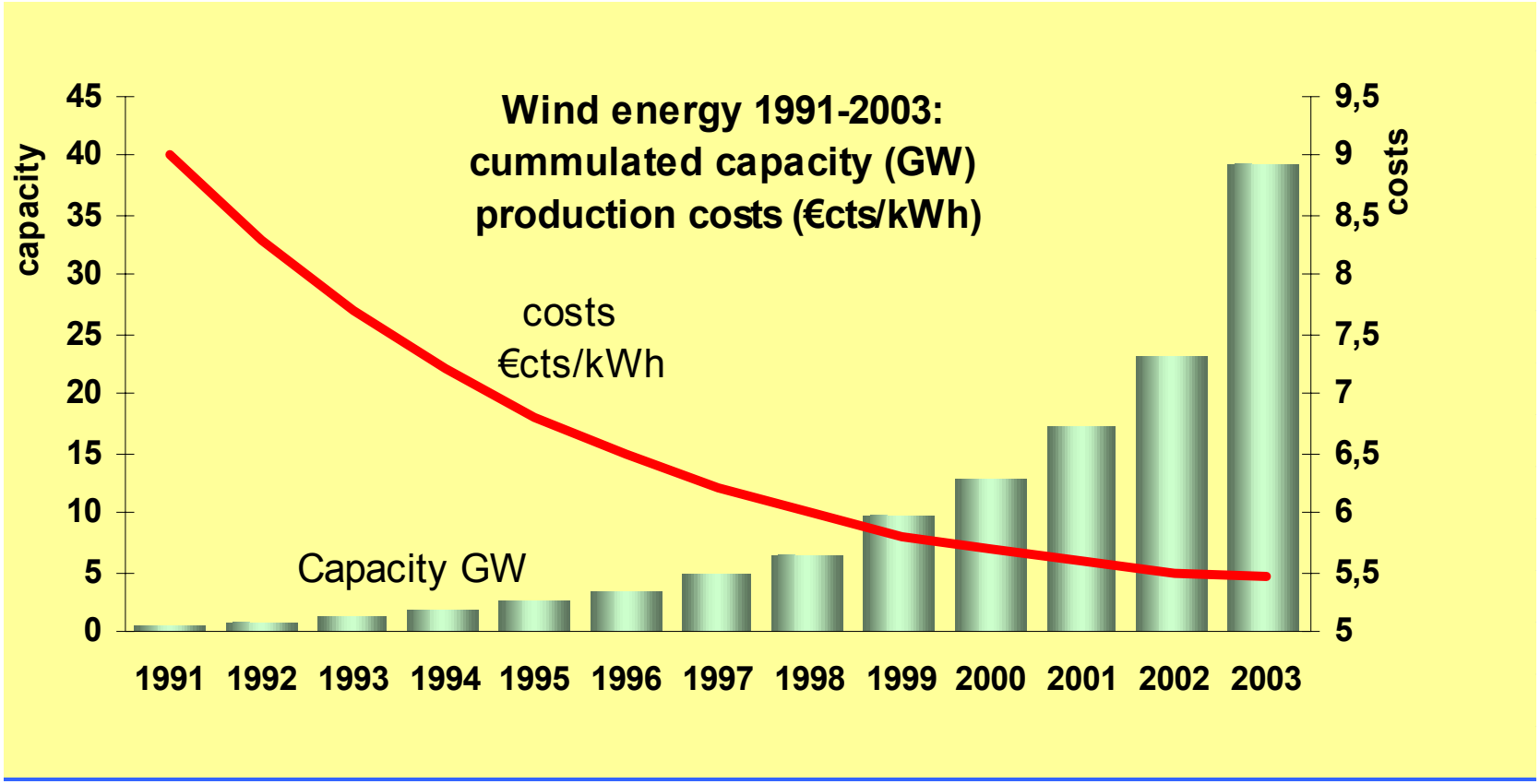
1.9 EU_{15}-Electricity Production by fuel



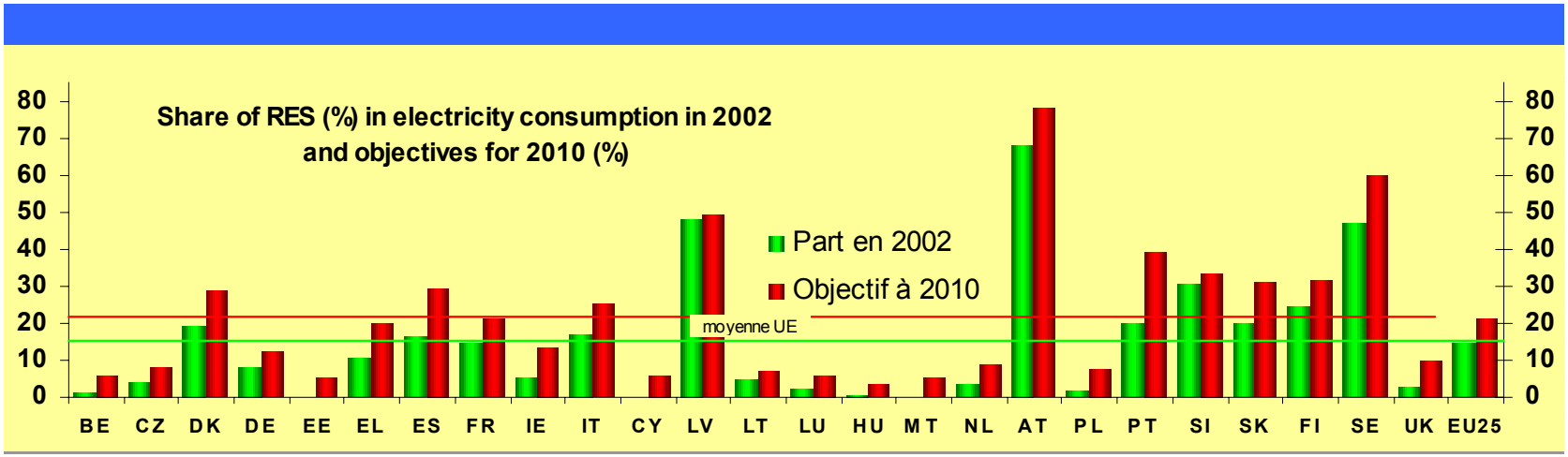
1.10 EU_{15}-Electricity production by RES



1.11 Production capacity and costs of wind energy



1.12 EU_{25} RES electricity consumption objectives 2010



1.13 EU Key instruments of interest for EnMan in utilities (legal framework)

- Directives for the liberalisation of the electricity-2003/54 and gas market 2003/55
- GHG-AT Directive 2003/87 of 13.10.03 and National Allocation Plans
- (proposed) Directive for linking JI and CDM to GHG-EAT
- Directive 2003/96 for energy taxation

1.14 EU Directive GHG-EAT: Key Issues (2003/87/EC)

- Compulsory cap and trade scheme
- Trading of allowances within MS and EU
- Allowances are allocated by MS in National Allocation Plans 1st 3y-period (2005-2007, 2nd 5years)
- Monitoring, reporting and verification by COM and MS according to EU guidelines
- Penalties for infringements: Excess emissions penalty of 40€/tCO_2 in the 1st phase and 100€/t in the 2nd phase

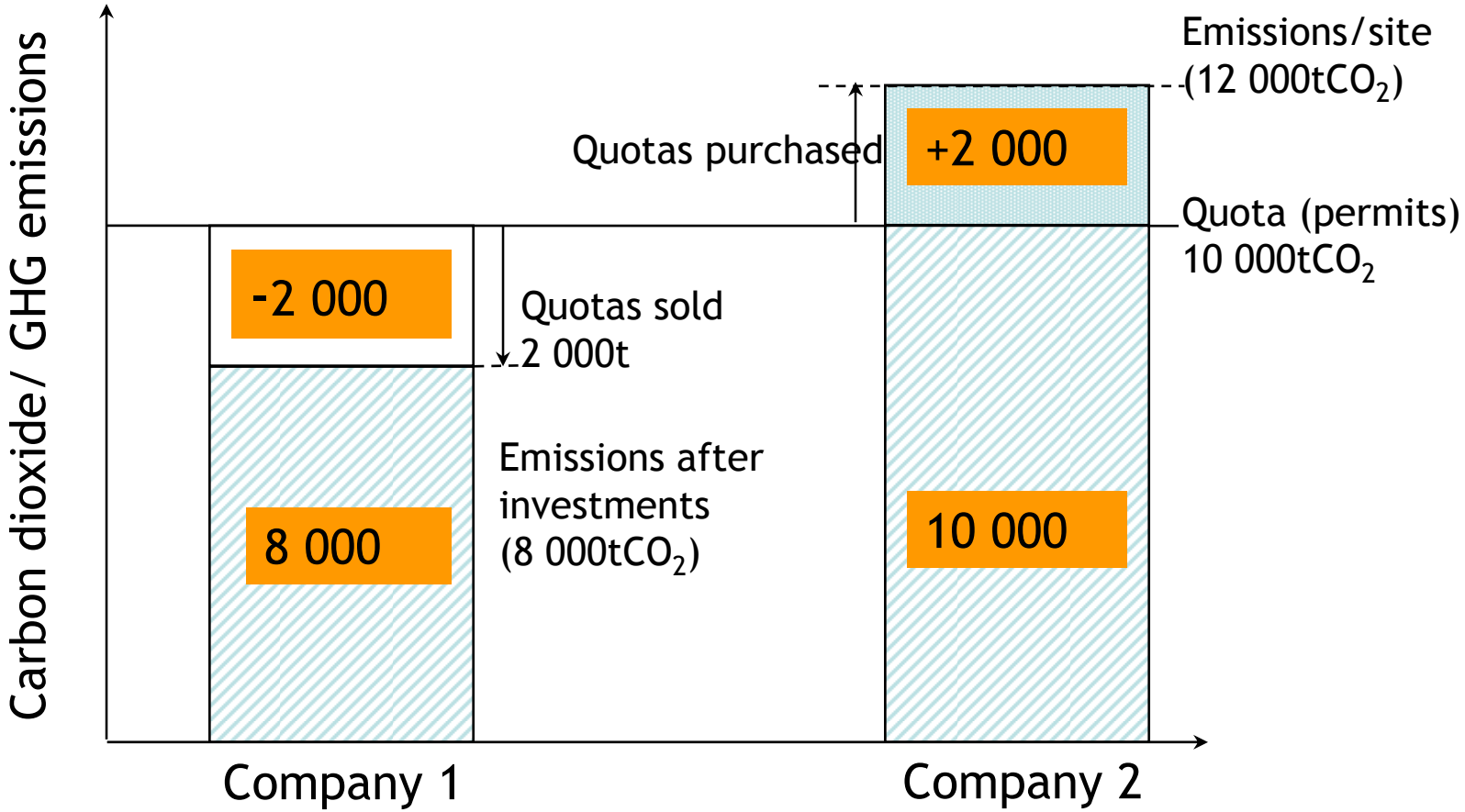
1.15 National Allocation Plans („NAPs“) to implement GHG-EAT Directive

- In NAP MS set up allocations for 2005/07 and 2008/12 covering the GHG-EA to be traded from permitted installations;
- EU-C „considers“ the NAPs and rejects incompatible elements or plans, (just done);
- All 25 NAPs will be monitored by the EU-C; reporting, proposals for adjustments etc.

1.16 Criteria for NAPs: Commission Communication COM(2003)830 7.1.2004

- Mandatory: Kyoto commitments, Assessment of emissions development, Potential to reduce emissions, Consistency with other legislation, Non-discrimination between companies or sectors, Involvement of the public, List of installations;
- Optional: New entrants, Early action, Clean technology, Competition from outside the EU;
- GHG-EAT starts on January 1st 2oo5

1.17 Practical, financial consequences for companies‘ investments and EnMan



1.18 Results for allowances traded with 20€/t; investment 200 000 €/10y

Utility 1

- Selling 2 000 allowances for 40 000 €/y
- During a 10 years period 400 000 €$_{2005}$
- Costs of investments 200 000 €$_{2005}$
- Results 200 000 €$_{2005}$

Utility 2

- Buys allowances for 2 000 t/y
- Costs of 40 000 €/y or 400 000 €$_{2005}$/10y

1.19 Result: investments more profitable! (except for outrunning plants !)

- Investment by far more effective than allowance-buying or penalties: +200 000 € versus -400 000 € (or -800 000 € with a penalty of 40€/t! but what about 100€/t later?)
- Result confirmed by conclusions of GETS Studies (Eurelectric/PWCL, 35 firms 2000/02)
- Price of GHG-EA traded in test schemes 2002/3 5-15€/t; Commission expects 20 €/t after January 2005
- Good business opportunities: if 5% of CO_2 emissions traded (200 Mt) at 20€/t business volume of 4 000 M€/y!

1.20 EU Directive linking JI/CDM into EAT scheme („amending Directive 2003/...)

- Both project based KP mechanisms allow the generation of credits (ERUs) through cleaner investments
- Would be the same unit of trade as for allowances
- Allows companies in the EU EATS credits to use JI/CDM credits to fulfil their obligations (cheaper?!)
- Reduction in allowance price and compliance costs
- JI/CDM credits will have equal value to allowances in EU EATS (forecast 10 – 20 €/tCO_2 equ.)
- Aprouved by Council of Ministers on 16.9.2004

1.21 Some other EnMan-relevant EU instruments (in addition to national one's)

- Electricity Directive: RES share of 10 up to 20%
- Energy efficiency directives, standards (SAVE programme and actions since 80) and
- Support programs for RES (ALTENER Program 74 M€ (98/02)
- Regional Policy 487 M€ (98/02)
- RTD (5th FP) "Energy" 1.042 M€ (98/02)

2.1 Environment Management („EnMan“) in company policies (four examples)

- Companies, big or small, consider EnMan rather different: „business“ or „burden“ ?
- Good examples from utilities, big one‘s RWE, Electrabel, Vattenfall-BEWAG, and regional one‘s as EnBW

2.2 RWE‘s EnMan activity (in 2003,04)

- Both on Corporate and Company level
- Some key values (corporation): Sales volume 44 billion €; el. production 280 TWh; staff 127 000
- RWE Power AG: Sales 9,3 b€; el. production 196 TWh; staff 19 200; Capacity 35 700 MWi; env. costs 431 M€ (in 2003, investments 56, expenditure 375)

- *PM: RWE Energie (Sales DE 12,2b€), RWE Innogy (UK gas,el.) Complex! Importance for Corp. level action! Difficulties for comparaisons with other companies!*
- *e.g.: E.ON no date available in reports, on web research ...*

2.3 EnMan in the RWE-Corporation Strategy

- RWE-C sets overall targets every 2-y in it‘s program *(„Konzernprogramm“)*
- Implementation through EnMan-Corporate Directive, EmMan-actions and annual audits
- Important in all major reports (e.g. „Geschäfts-bericht 2003“, „Nachhaltigkeits-), cost indications, EnMan key issue in RWE‘s SDS, etc.)

2.4 RWE EnMan Corporate Directive

- Objectives: establishment, maintenance of EnMan by all companies and its effective coordination
- Tasks and responsabilities:
  - Environmental Coordinator (attached to Corp. Executive Board) for advisory and monitoring actions, support by RWE AG‘s Environmental Affairs/R&D
  - Management Company Executive Bord members
  - „ „ Environmental Officers
  - Environmental Coordination Committee

2.5 RWE‘s Environmental Coordination Committee :

- Prepares recommendations for env. policy and program
- Shares experience on EnMan, environmental protection
- Works on cross-divisional issues for EnMan and „
- Helps the management of the companies for specific regulations
- Prepares the Environmental Report
- Gets support from environmental officers of different companies and plants

2.6 RWE EnMan - Reporting

- Information key issue for RWE Corporation activities in environment management
- Information of general public by Environment Report (now SD-) every 2 years
- Internal reporting: new system to be set up *(different in other utilities ....)*

2.7 Electrabel (BE): Key Figures

- Electrabel („energy arm“ of Suez,), present in 10 countries in EU (one of the largest company):
  - Sales (mainly electricity) 10 800 M€
  - El. prod. (49% CO_2 em. free!) 137 TWh
  - Capacity (40% CO_2 em. free!) 27 000 Mw_i
  - CO_2 emissions 336 g/kWh 42 Mt CO_2
  - Staff 14 000
  - EnMan systems ISO 14001 (for 50% cap)
    EMAS-registration (20 % cap)

2.8 Electrabel: Core business

- Core business:
  - Sales of electricity,gas and energy products and services
  - Generation of electricity
  - Trading of electricity and gas
  - Management of electricity and gas networks on behalf of DSOs

2.9 Electrabel: EU-wide activities

2.10 Electrabel: Electricity sales and - generation all over Europe (ctd)

1.	NL	23.000 GWh
		4.700 MW
2.	Be	76.600 GWh
		13.000 MW
3.	Lx	2.700 GWh
		400 MW
4.	FR	3.700 GWh
		4.800 MW
5.	SP	3 GWh
6.	Port.	50 MW
7.	DE	6.200 GWh
		130 MW
8.	PL	9.000 GWh
		1.600 MW
9.	Hu	5.100 GWh
		2.100 MW
10.	It	10.500 GWh
		2.000 MW
(in compar. Cz		*73.000 GWh)*

2.11 Electrabel: Environmental action

- El. gen. 137 TWh; nuclear 36%, conv. th. 26%, gas comb. cycle 18%, RES (hydro, wind)12%, cogen. 8%
- Avoided CO_2 emissions by nuclear (in B) 35,5 Mt/y
- Important ENV programm („Env. Report 2003“); 10 env. principles for management (see reports 2002 and 2003)
- Electrabel-Deutschland: some production (e.g. Gera), sales ! Just won Land Berlin as client *(not BEWAG!)* 900 GWh/y; 100 M€ worth

2.12 Electrabel: Environmantal action (ctd)

- Complete service package (incl. gas, fuel, water; training)
- Offer of „green“ electricity in the NL (Bm- and wind-generated), TÜV certified 100% RES (TÜV EE-02), as well as in FR (hydro, Companie Nationale du Rhône)
- Dev. of CHP- and RES projects with customers (2 MW)
- ISO certification for 14.000 MWi (50%)
- EMAS registration for 5.600 MW (19%)
- Equipment of plants with advanced flue gas systems
- Operation of 20 CCGT plants
- Windpower and biomass burning technologies (237 GWh)

2.13 Vattenfall, V-Europe (BEWAG)

- Vattenfall 3rd in DE, 5th in EU: SW, DE, SF, PL
- Sales 15 b€ 187 TWh; Production 158 TWh,
- Heat production 35.6 TWh in 2003
- Staff 39 500 (including BEWAG)
- Important actvities in CO_2 reduction in particular through new efficient investments: -51%/1990
- EnMan Systems (certified with ISO 14001) include life cycle impact

2.14 BEWAG – some general facts

- In 2003 100% Vattenfall Europe AG
- Medium size company: Sales 3 000 M€; 8 TWh electricity and 10 TWh heat; Staff 4 500; Capacity 7 000 MW_i; CHP 45%
- *1st CHP plant in Europe in 1911 (town hall of Charlottenburg), 1927 Klingenberg ... now all)*
- CO_2 emissions 9.4 Mt, -85%/1990

2.15 BEWAG EnMan activity (in 2002)

- EnMan System built up acc. to EMAS regulation
- Pyramid structure: Board Ex. Members, Unit Env. protection, EnMan officers in diff. sectors, EnMan manual, specific working groups, EnMan-training programs, -information and -reporting
- Environment Report 2001/2002
- Environment declaration HKW-Mitte 2002

2.16 BEWAG Environment Protection Guidelines

- Environment protection as corporate mission
- Information and responsability inside
- Rational use of fuel; waste avoidance, recycl.
- Cross-company information exchange
- Advice and consulting services for customers
- Research and technology development
- Information of the large public

2.17 BEWAG Expenditure for Environmental Protection

- Total expenditure for Environmental Protection 50 M€/2002 *(relatively high!)*
- Investments in pollution control, water protection (treatment), waste and reycling: 5 M
- Current operating exp. production related, costs of materials, fees for audits etc.: 26 M
- Current capital spending (interests ...) 20 M

2.18 Greater regional utility: EnBW (D-BW)

- Big regional (internat. link through EDF participation)
- Key data: Sales 10 600 M€ (el. 7 400 M€),
- El. generation 71 TWh (+/- Cz), -capacity 13.8 GW_i,
- Staff 24 500, 5.4 M clients;
- Important EnMan- and SD activity:

  - Environment and Society Report 2003: „On the Road to Sustainability“; *interesting report!*

  - Environment protection as a corporate mission, in business units, environment in generation area, RES, energy services, climate protection, innovation, etc.

2.19 EnBW EnMan Organisation

- EnMan directly attached to the CEO
- EnBW board member (assisted by Energy Pol. Unit)
- Executives of utilities and subsidiaries
- „Environmental Protection Unit“ („Stabsstelle“)
- Environ. Protection Officers in utilities and companies
- Information groups also in all subsidiaries

3.1 EnMan Research, Training legal frame (EU and MS)

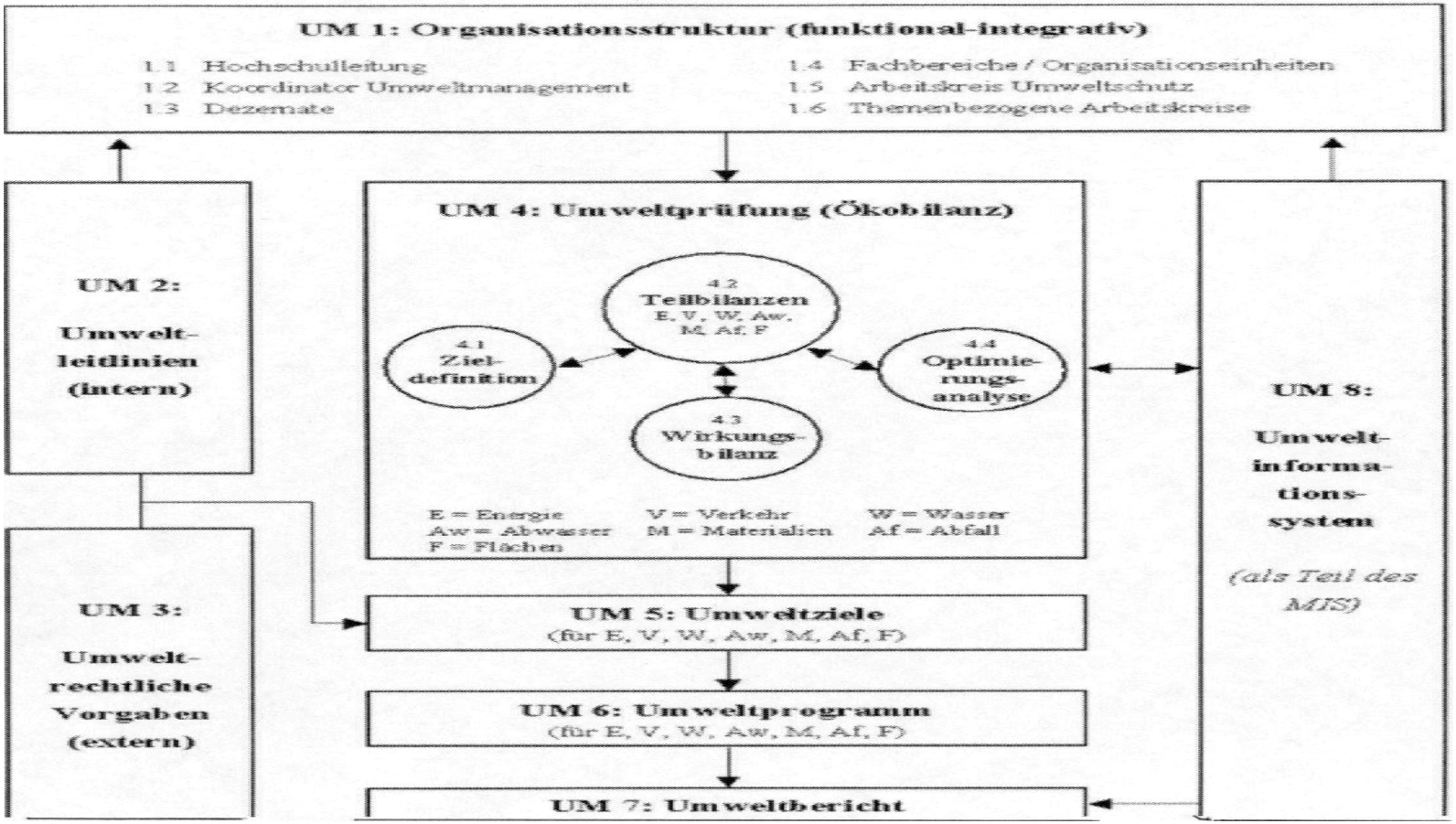
- Many universities in Europe undertake research and provide lectures on the development of methods for Environmental Management and its implementation
- Further complementary elements for practical implementation are developped by consultants
- Legal framework and technical instruments are provided by EU-C and MS (EMAS, ISO 14001, etc.)

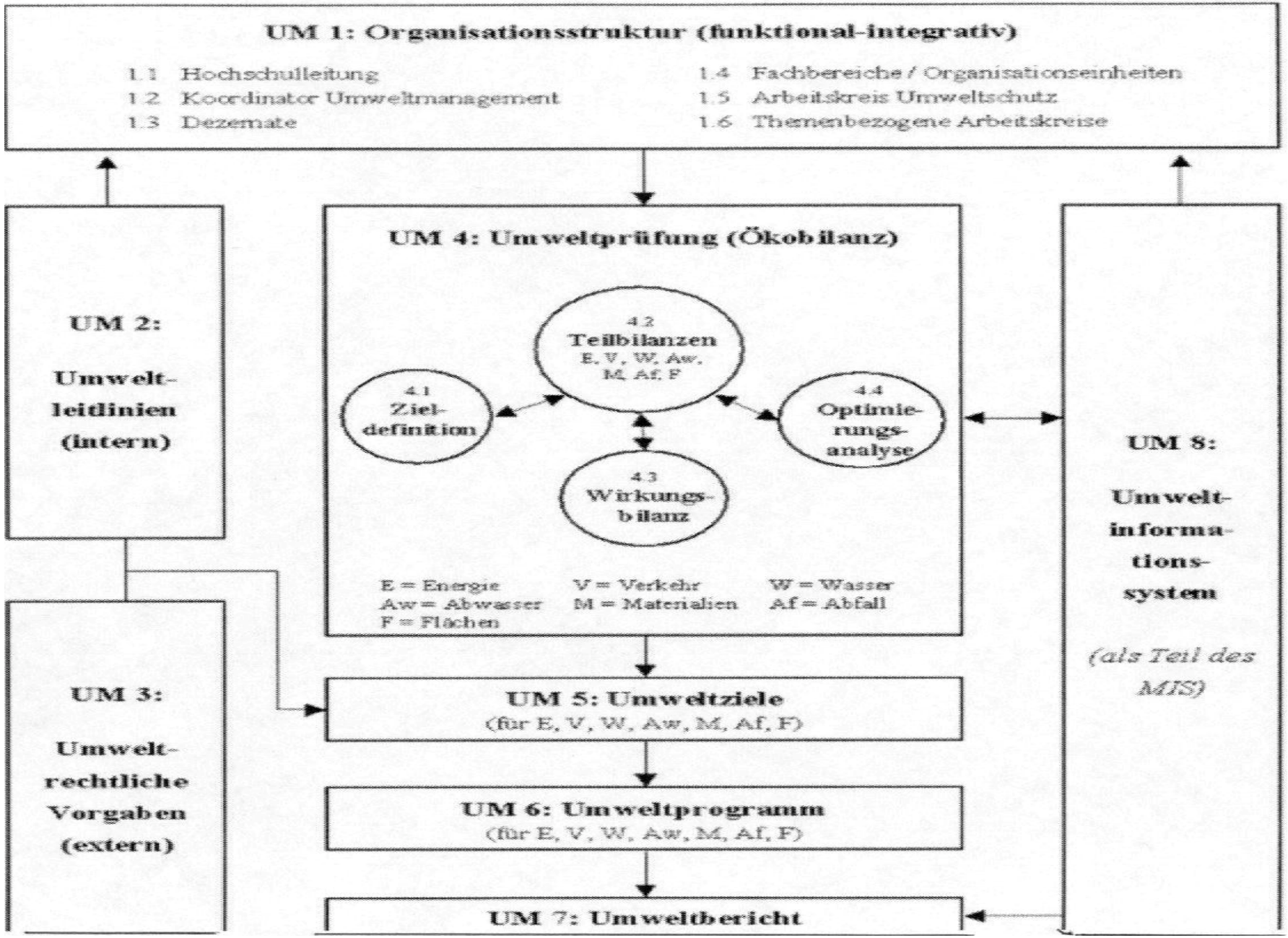
3.2 EnMan-teaching in Universities e.g. IESR University of Osnabrück

1. Organisational Structure
2. Environmental Guidelines
3. Environmental Regulations
4. Environmental Audit (Eco-balances)
5. Environmental Goals
6. Environmental Program
7. Environmental Report
8. Environmental Information System

3.3 EnMan-Model Univ. of Osnabrück

Graph for 8 Building Blocks (IESR, UO)




UM 1: Organisationsstruktur (funktional-integrativ)
1.1 Hochschulleitung
1.2 Koordinator Umweltmanagement
1.3 Dezernate
1.4 Fachbereiche / Organisationseinheiten
1.5 Arbeitskreis Umweltschutz
1.6 Themenbezogene Arbeitskreise
UM 2: Umwelt-leitlinien (intern)
UM 4: Umweltprüfung (Ökobilanz)
4.2 Teilbilanzen E, V, W, Aw, M, Af, F
4.1 Ziel-definition
4.4 Optimie-rungs-analyse
4.3 Wirkungs-bilanz
E = Energie
V = Verkehr
W = Wasser
Aw = Abwasser
M = Materialien
Af = Abfall
F = Flächen
UM 8: Umwelt-informa-tions-system
(als Teil des MIS)
UM 3: Umwelt-rechtliche Vorgaben (extern)
UM 5: Umweltziele
(für E, V, W, Aw, M, Af, F)
UM 6: Umweltprogramm
(für E, V, W, Aw, M, Af, F)
UM 7: Umweltbericht

3.4 Research in EnMan (Univ. Lüneburg)

Research, lectures, many projects and publications:

- Environmental Information Management
- Sustainable Financing
- Fundamental Principles of EnMan
- Management of Stakeholder Relationship !!
- Integration of Environmental Economics and Management

3.5 Environmental Legislation
(ref. ourworld.compuserve.com)

- Environmental law: Regulations and decisions for waste, energy, immission-protection etc.
- EU legislation in environment policy
- International and national environmental legislation
- EnMan Guidance and References
- And dozens of EnMan-related matters

3.6 Eco-Management and Audit Scheme (EMAS): Overwiew

- EMAS is a management tool for companies to evaluate, report and improve their environ-mental performance
- Created by EU Regulation 1836/93 in 1993 and improved by Regulation 761/2001; it inte-grates now the EN/ISO 14001
- Participation is voluntary and spread all over Europe and over all sectors of the economy

3.7 Main stages of EMAS

To receive EMAS registration a company must comply with the following steps:

- Conduct an environmental review
- Establish an environmental management system
- Carry out environmental audits
- Provide a statement of the environmental performance

All this needs to be approved by an accredited verifier and the validated statement has to be sent to EMAS for registration; the EMAS logo can then be used.

3.8 Most common benefits of EMAS implementation

- Reduced costs on inputs (e.g. energy consumption)
- Risk minimisation leading to financial benefits
- Development for improvements in efficiency
- Maintained/increased competitiveness
- Enhancing of business management
- Improving ability to comply with env. legislation
- Raising companies profile, relations with customers
- Participation of staff in the company‘s l-t development

3.9 Costs of implementing EMAS, funding possibilities

- External costs: verifier (market prices for consultancy), registration fees and additional external support
- Internal costs: (difficult to quantify) from minimal cost solutions up to investment in higher level of performance, internal resources to implement the scheme (x days, y months), system maintenance
- Funding possibilities through grants and loans (see guide to Community funding) of LIFE-Environ-ment programme and similar instruments of MS

3.10 ISO series EN ISO 14000 of environ-mental standards and guidelines

- Environment management systems EN ISO 14001, 04
- Guidelines for auditing EN ISO 14010,11,12
- Labels and declarations EN ISO 14012, 20, 21
- Evaluating environmental performance EN ISO 14031
- Life cycle analysis EN ISO 14040-43
- Understanding terms and definitions EN ISO 14050

ISO 14001 is complementary to and fully integrated in EMAS

3.11 EnMan special consultant firms and training

- Consultancy is important for establishing EnMan and certification schemes (e.g. DQS Zertifierungsgesellschaft, market leader in certifi-cation: 46 836 certificates)
- Those companies as well as specific training organisations offer 2-days workshops to explain objectives, establishment, content, advantages (benefits) and costs of EnMan systems, etc. (e.g. VOREST)

4.1 Conclusions

- EnMan is a rather new area of growing importance for most sectors of the economy
- Expending market for investments and advice not only for utilities but generally for industries and service sector where expertise and labour will be needed increasingly
- Sustainable Development Strategies, environmental action and climate protection are only at the beginning in EU and in the Czech Republic

4.2 Conclusions

- The Czech energy markets will further go through great structural changes (mergers)
- EU and Cz environmental legislation will become increasingly important and a key factor for companies‘ decision making and hence for their EnMan
- There should be serious chances for job creation and skilled people
- Meanwhile this might be a suitable subject for academic work

Annex 1.1 Main Sources (a)

- IPCC Report on Climate Change (latest version 2003), (UNEP) www.ipcc.ch and UNFCCC http://www.unfccc.int/
- EU: http://europa.int/comm/environment/docum/00749_en.htm
- EU: europa.eu.int/comm/dgs/energy_transport/index_en.html
- EU: http://europa.eu.int/prelex/rech_simple.cfm?CL=en.
- EU Energy and Transport Figures Statistical Pocketbock 2003 ISSN 1725-1095 tif@cec.eu.int
- EU Directive 2003/87/EC of 13. Oct. 2003 establishing a GHG ATS
- EU Directives for the internal electricity market 2003/54/EC of 26 June 2003; same for gas market 2003/55/EC
- EU Directive on energy taxes 2003/96/EC of 23 October 2003

Annex 1.2: Main Sources (b)

- Reports from RWE www.rwe.com , EnBW www.endw.com , Vattenfall www.vattenfall.com , BEWAG www.bewag.de , Electrabel www.electrabel.be
- Technical University of Berlin, Instutue of Technology and Management, Energy and Environment Management www.energiewirtschaft.tu-berlin.de
- Universities of Osnabrück und Lüneburg www.usf.uos.de , www.uni-lueneburg.de
- Umweltrecht http://ourworld.compuserve.com
- EMAS, ISO 140001 etc. http://europa.eu.int/com/env/emas
- Service companies: DQS www.dqs.de , VOREST AG www.vorest-ag.de , Symposion Publishing www.symposion.de

Annex 2: Abreviations

EnMan Environmental Management
GHG Greenhouse Gas
GHG-ER Emission Reductions
EAT Emission Allowance Trading
UNFCCC UN Framework Convention on Climate Change
PaM Policies and Measures
JI Joint Implementation
CDM Clean Development Mechanism
RES Renewable Energy Sources
Mtoe Million tons of oil equivalent
bt billion tons (Mrd Tonnen)
MS Member State (of EU)
NAP National Allocation Plan
EP European Parliament

EC European Community (for legal texts)
EU-Com Commission of EU
EU-CoM EU Council of Ministers
RTD Research, Technology, Development
CHP Combined heat and power
SDS Sustainable Development Strategy
EMAS Eco-Management and Audit Scheme (EU DG ENV)
GETS GHG Emission Trading Simulation
EN European Norm
ISO International Standard Organisation
KP Kyoto Protocol
ERU Emission Reduction Units
DSO Distribution System Operators
5th FP 5th Frame Work Programme

Annex 3: Global Warming Potential of GHG within 100 years

- Carbon Dioxide (CO_2) 1
- Methane (CH_4) 21
- Nitrous oxide (N_2O) 310
- Perfluorocarbons (PFCs) 8.000
- Hydroflourocarbons (HFCs) 140 - 12.000
- Sulphur Hexafluoride (SF_6) 23.900

Annex 4: Global Warming Impact of GHG emissions 2001 over 100y

GHG	%	Mt CO_2	GWP 100 y	100 y	%
CO_2	80	2 464	1	246 400	0,59
CH_4	15	462	21	970 200	2,31
N_2O	4	123	310	3 819 200	9,09
3 FCs	1	31	12 000	36 960 000	88,01
Total	**100**	**3 080**		**41 995 800**	**100,00**

Annex 5: CO_2 emission perspectives EU-15

Sector	Shares 1990	*2010*	Increase 2010/1990
• Electricity/Heat	32 %	*30 %*	+ 2 %
• Energy sector	4 %	*5 %*	+12 %
• Transport	24 %	*30 %*	+ 39 %
• H'holds/Tertiary	21 %	*20 %*	+ 4 %
• Industry	19 %	*15 %*	- 15 %

Emissions trends worrying ! +6% ? versus reduction goal -8% !

Annex 6 Some key figures for utilities

Utilities and subs.	Sales bill.€	El.prod TWh	Cap MW	Staff 1000	CO_2 em.	Env. Costs M€
RWE Power AG	44 9	280 196	n.a. 35.700	127 19	n.a.	n.a. 430
Electra bel	10,8	137	27.000	14	42	n.a.
Vattenf. BEWAG	15 3	188 8	n.a. 7.000	40 4,5	n.a. 9	n.a. 50
EnBW	10	71	14	24,5	n.a.	n.a
NB „n.a.“	*means*	*also*	*diff. to*	*use*		