European Union / Instrument For Pre-Accession Assistance (IPA) Energy Sector Technical Assistance Project

This project is co-financed by
the European Union and the Republic of Turkey.

Task 1: General Training on Energy Planning and Energy Sector Modelling

Inception Meeting: Task 1 – General Training

Dr. Wietze LİSE

Ankara, 9 November 2018

T.C.
ENERJİ VE
TABİİ KAYNAKLAR
BAKANLIĞI

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

eXergia
ENERGY & ENVIRONMENT CONSULTANTS

E3 Modelling
Energy Economy Environment

Scope of work – Task 1

- **Objective:** increase capacity of MENR on energy modelling and on utilization of energy sector modelling and planning tools

- To deliver a series of training sessions addressing broader issues pertinent to energy modelling and planning

- **→ crash course at MSc level to provide thorough understanding of key underlying principles for energy planning and energy sector modelling tools**

- Theoretical training for MENR participants by the Consultant's experts.

- The aim of this training is that all participants acquire a common understanding on roles of modelling tools in energy sector planning.

- This will prepare them for **specific focus related to EST in Task 2**

Activity description

- In total 60 hours of training are required, namely 2x5x6 hours.
- Targets 40 trainees.
- **Language of slides: English; lectures in Turkish (if possible) or English**
- Format of the training will be part instruction using powerpoint presentations and part exercise, where MENR participants can work on finding solutions to their day to day challenges.
- To improve involvement of the participants through (planned) interaction.
- The classroom style lectures will be provided by professionals with deep knowledge of the topic.
- Training of Task 1 to take place in 2nd week of December 2018 (week of 10 DEC 2018) and 5th week of January 2019 (week of 28 JAN 2019).
- The training will end with a multiple choice exam to verify if the participants picked up on the taught material

Our expectations from MENR

- To arrange a place where 40 employees of MENR can be trained, which will include coffee breaks and lunches

- There should be simultaneous translations, beamer+computer

- To choose and assign 40 participants of MENR to the trainings, who can be fully focused on the content for optimal benefit

- Also the level of training of the MENR participants should be at least at the Bachelor's level (to the extent possible)
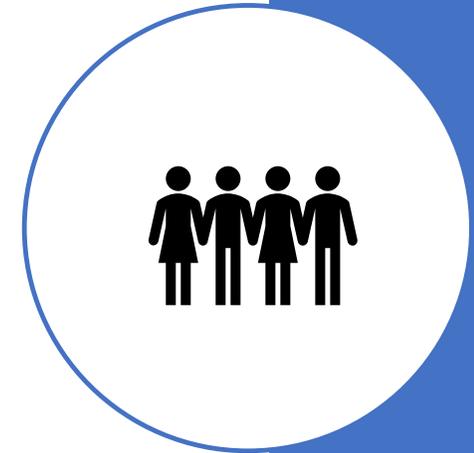
DEC & JAN

Training example

1. Main principles for modelling:

Basically 3 approaches can be followed:

- Use an existing model
    - Relatively low effort, but also low flexibility

- Develop a tailor-made model from scratch
    - High effort required, but very flexible

- Hybrid: modify existing model(s)
    - Finding a compromise between effort and flexibility

Footnote to the use of models:

- Any Model is a necessarily a simplification of the reality

- Can be used to answer what-if questions

- Can discover unknown effects

- Can show the total effect of interactions; bring order in complexity

- Results are never fully accurate

- Can support and guide policy decisions
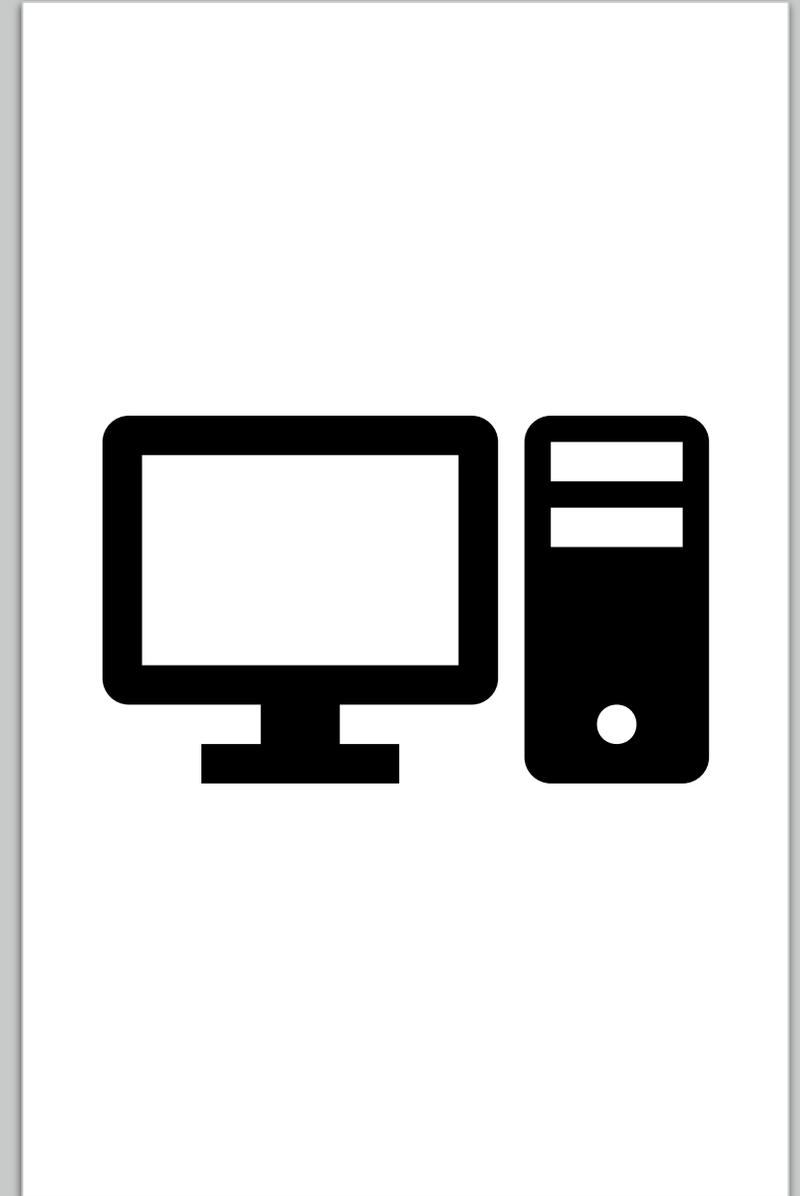
2. Issues to be taken into consideration:

- Where is the model going to be used for?

- To what extent is the required data available from public sources?

- To use a licensed software:
  - AIMMS, GAMS, MPSGE, Plexos, MATLAB, C++, Delphi, Turbo Pascal
  - Could be costly; required specifically trained staff
  - More user friendly, full flexibility

- Or use standard MS office applications like EXCEL or ACCESS:
  - Is standardly equipped with Visual Basic
  - Transferable to others
  - But not particularly user friendly

3. Model type, sectoral coverage, level of detail and complexity

- What kind of model:
  - Static (one moment) – dynamic (multiple interacting moments)
  - Optimisation (objective minimisation) – simulation
  - Applied General Equilibrium (AGE) or partial equilibrium (game theory)
- Subject coverage
  - One subject: energy/electricity demand
  - Multiple subjects: Economy – energy – environment
    - Electricity pricing and equilibrium models (ORDENA)
    - Integrated Assessment Models
- Scales
  - Temporal scale: hourly, daily, monthly, yearly
  - Sectoral scale: industry/residential/commercial or more detailed
  - Geographical detail: national or regional
- Complexity
  - Simple model: metaphorical narrative to explain a process
  - Single issue: very detailed analysis of one particular sector
  - Interacting issues: integrated assessment across sectors, years and issues

General structure of the General Training

Day 1-2: Macro-economics; relation between energy and economy

Day 3-4: Energy modelling and energy balance tables

Day 5-6: Energy planning and modelling decision making

Day 7-8: Energy modelling tools and application of these tools

Day 9-10: Role in overall planning and mathematical programming

DEC & JAN

Training programme in detail

Day 1 and 2

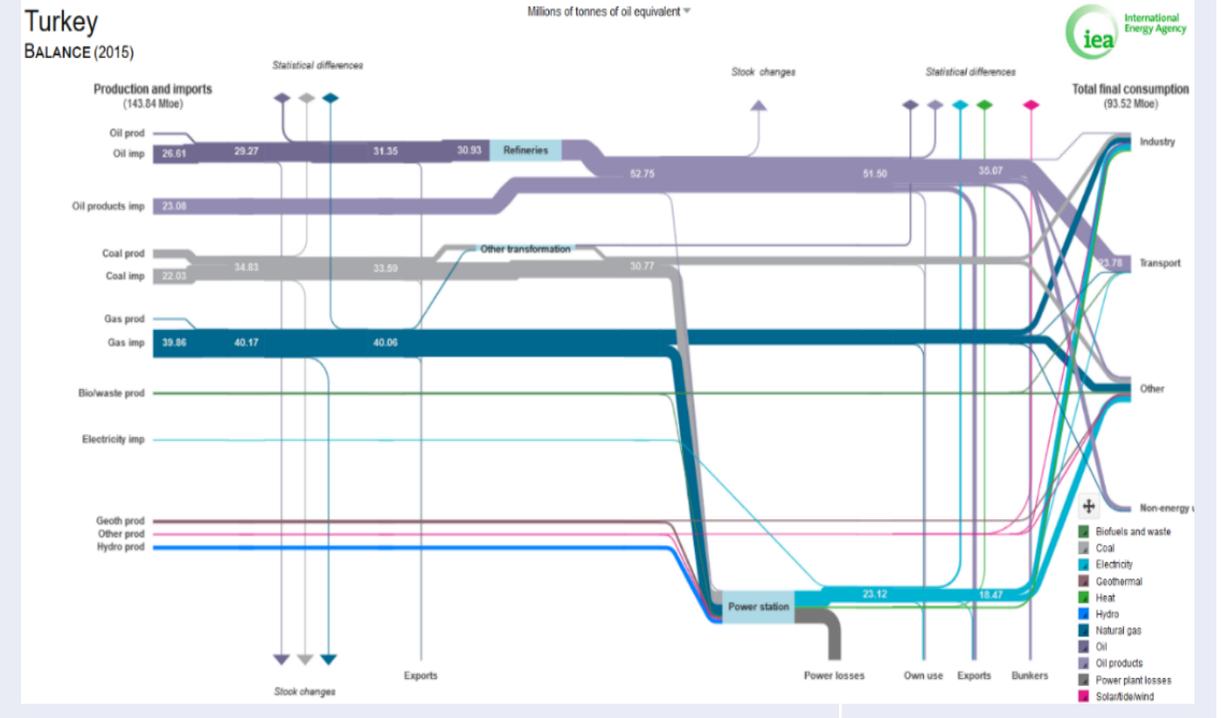| Date	Title and description of Training	Responsible
10/12/2018	**Fundamental Macroeconomic analysis and its relationship with Energy Supply and Demand**	**Mercados Turkey**
	This will be an introductory course into macroeconomics with relevance to the energy sector, covering demand and supply equilibrium and settlement prices, merit order curves and elastic demand.	
11/12/2018	**De-coupling of Economic Growth and Energy Consumption. Efficiency and Sustainability**	**Mercados Turkey**
	Decoupling of economic growth and energy consumption as expected by the Kuznets curve will be presented and various articles will be discussed.	
	This decoupling is due to efficiency improvements, which is an alternative way towards sustainable development.	
	Further, the issue of co-integration and error correction models will be presented.	

Day 3

Date	Title and description of Training	Responsible
12/12/2018	**Basic concepts and notions in energy modelling and definitions**	**Mercados Turkey**
	A basic introductory course will be presented covering all relevant issues in modelling the energy sector. This will first focus on the key concepts in the power sector, but will continue with the natural gas sector and other energy sources as well. Topics to be covered include the following: • Energy Demand Forecasting techniques, final energy consumption, energy supply, • fixed & variable cost, availability factor, levelized cost, load curve, • capacity factor, probabilistic methods for renewable generation, unit conversion, • energy balance, fuel switching, electrification of transportation and heating sectors, • principles of energy economics and finance	

Day 4 and 5

Date	Title and description of Training	Responsible
13/12/2018	**Introduction and analysis of energy balance tables**	**Mercados Turkey**

This training day will be devoted to introducing all key aspects related to the energy balance tables, *Sankey diagrams*, their typical data sources and interpretation of these energy tables.

Moreover, the Consultant will tell about the formation process of energy balance tables from the start to end, including data collection, data sources, data verification, data validation, survey framework, survey details, reliability analysis of final energy balance table, management of confidential data, etc.

Day 5 and 6

Date	Title and description of Training	Responsible
14/12/2018	**Energy planning practices in selected EU countries**	**Mercados Turkey**
	This training day will focus on energy planning practices in the some predetermined countries, which are of particular interest to Turkey, and the key lessons that can be drawn from the experiences in these countries will be discussed.	
28/1/2019 Morning	**Introduction to modelling, purposes, classifications, important aspects, etc.**	**Mercados Spain**
	This session will provide a general introduction to modelling. What is the purpose of modelling, what are the limitations, which modelling approaches can be followed, etc. A general introduction to modelling had already be made in the previous IPA project **(EU-IPA12/CS01)** and the main lessons from this project will be summarized here as well.	
28/1/2019 Afternoon	**Rationale for modeling energy systems and serving decision making**	**Mercados Spain**
	The topic of rationale for modelling energy systems and serving decision making will be covered.	

Day 7

Date	Title and description of Training	Responsible
29/1/2019 Morning	**Energy sector modeling tools and modeling approaches of these tools widely used/applied in the world/literature**	**Mercados Turkey**
	This half-day training will again start with the outcomes of the previous IPA project. Various energy sector modelling tools will be presented and discussed. Moreover, the extent of their use in practice and their appearance in the literature will be highlighted. Modelling tools to be covered: Energy supply models, which are generally fundamental models of the gas and power market, where the sectors are analysed either in combination or separately: PRIMES, ORDENA, SDDP, PLEXOS, PROSYM, TIGER, EGGM, POLES, among others.	
29/1/2019 Afternoon	**Functionalities of these modeling tools, including advantages and disadvantages**	**Mercados Turkey**
	The morning session will analyse the modelling tools including the trade-offs for their use.	

Day 8

Date	Title and description of Training	Responsible
30/1/2019 Morning	**Utilization of these modeling tools worldwide, case studies, especially in EU countries**	**Mercados Turkey**
	This training will go into details of the practical examples where the models have been used. For instance, impact assessment, what-if analysis of the energy efficiency and climate policies, monitoring of the country or countries as keeping up to their set climate and energy targets.	
30/1/2019 Afternoon	**Data requirements for these modeling tools, QA/QC Procedures**	**Mercados Turkey**
	This training day will go into the challenge of gathering data in the right format for each type of model. The issue of confidentiality and expertise required to make expert judgement to fill missing data with reasonable assumptions. The quality of the data can be verified to testing the model results and verifying to what extent the model is successful in replicating data realization.	

Day 9 and 10

Date	Title and description of Training	Responsible
31/1/2019	**How to implement energy planning into overall planning**	**EXERGIA**
	This training course will discuss practical examples of incorporation of energy planning modelling results into the broader context of strategic energy planning at a country level. Examples from the European experience will be provided.	
1/2/2019	**Mathematical Programming** Linear optimization techniques Nonlinear optimization techniques Mixed Complementarity optimization techniques	**E3 Modelling**

Resources

Dr. Nicola Gallo (KE6, Energy Planning and Modelling Training Expert) will lead and coordinate this task.

- He will ensure that training material of this general training is not duplicated, and to organize input from key and non-key experts.

Trainers are Dr. Nicola Gallo (KE6) and Dr. Wietze Lise (KE4), with contributions in specific Topics by Dr. Theodor Goumas (KE1 – TL) and Dr. Leonidas Paroussos (KE3).

The proposed Non-Key Experts, and especially those being locally based in Turkey, will have an active role in these trainings.

The specific allocation of delivery of trainings among Non-key Experts will be realized as per the specific MENR needs and related topics

Outputs

No	Name of deliverable	Description	Timeline
D1.1	Task 1 Report	• All training material will be presented in a report with a general introduction to the material. • Files with the recorded training sessions in in a convenient media format compatible with the capabilities of a typical PC.	Month 4