

TIMES VEDA Training Course Astana, September 8-11, 2008

Objectives:

- To better understand the MARKAL – TIMES modelling paradigm
- To develop abilities to use the TIMES – VEDA tools
- To develop abilities to build a new TIMES model
- To start the recalibration process of three ETSAP-TIAM regions

Venue Astana, conference hall in Zhas Amir hotel, 17 Kenesary str.

Trainers G.C. Tosato, Eng. Maurizio Gargiulo

Suggested readings: see attached list

HW/SW: Each participant comes with his/her own laptop. At the start, the SW of ETSAP tools will be loaded where not yet available, with temporary licences if necessary.

Program

Monday

9.30-9.40 Welcome (Kanat Baigarin)

9.40-11.00 Input parameters regarding oil and gas from Russia, Kazakhstan, etc (WP2&3)

11.00-11.15 Tea/coffee break

11.15-13.00 Continuation

13.00-14.00 Lunch

14.00-14.15 Round table. *The participants present:*

- *the models they use themselves (this will help understand the different types of knowledge of the group);*
- *and their expectations with their possible use of TIMES models*

14.15-15.00 Background on energy systems analysis, modelling and scenarios

15.00-16.00 How to build and solve with TIMES – VEDA a single region model (tutorial)

16.00-16.15 Tea/coffee break

16.15-17.30 Continuation

17.30-18.00 Questions

Tuesday

- 9.00-10.00 Different energy modelling approaches
Technical-economic models
- 10.00-11.00 TIMES-Tutorial: How to run alternative scenarios and analyse the results
How to interpret the results
- 11.00-11.15 Tea/coffee break
- 11.15-13.00 TIMES-Tutorial: How to interpret the results
- 13.00-14.00 Lunch
- 14.00-16.00 Building and running a simple two regions model
- 16.00-16.15 Tea/coffee break
- 16.15-17.00 Questions

Wednesday

- 9.00-10.00 TIMES equations, variables and objective function
- 10.00-11.00 Presentation of the ETSAP – TIAM model
- 11.00-11.15 Tea/coffee break
- 11.15-13.00 Distribution of the base template of relevant ETSAP-TIAM regions
Working with the ETSAP-TIAM model, results analysis
- 13.00-14.00 Lunch
- 14.00-16.00 Recalibration of the single region models to the base year (2005):
- Parallel session 1: the new Russia region (code: RUS)
 - Parallel session 2: the new Central Asia-Caucasia region (code: CAC = Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan)
- 16.00-16.15 Tea/coffee break
- 16.15-18.00 Continuation of the parallel sessions

Thursday

Continuation (details to be decided)
Guidelines for continuing the recalibration at home

Available and useful documentation VEDA-TIMES models

(05/06/2008)

Description of MARKAL/TIMES models

1. Loulou R., U. Remne, A. Kanudia, A. Lehtila and G. Goldstein. 2005. Documentation for the TIMES Model. Energy Technology Systems Analysis Programme (ETSAP).
 - Part I. 78 p. <http://www.etsap.org/Docs/TIMESDoc-Intro.pdf>
General description of the TIMES paradigm, general structure, economic significance, simplified mathematical formulation of TIMES, model options.
 - Part II. 349 p. <http://www.etsap.org/Docs/TIMESDoc-Details.pdf>
Comprehensive reference manual intended for the technically minded modeller or programmer looking for an in-depth understanding of the complete model details, model mathematics, full description of the sets, attributes, variables, and equations of the TIMES model.
 - Part III. 20 p. <http://www.etsap.org/Docs/TIMESDoc-GAMS.pdf>
Description of the GAMS control statements required to run the TIMES model

User's guides and notes ("How to")

2. Gargiulo M., 2008. Getting started with TIMES-VEDA. Draft 2.1. Energy Technology Systems Analysis Programme 180 p. With contributions of Gary Goldstein, Amit Kanudia, Antti Lehtila, Uwe Remme, GC Tosato.
http://www.etsap.org/Docs/Files_Times_Tutorial.zip
This very complete manual explains how to start building a technical-economic model of your energy system, and its possible developments over time, with TIMES-VEDA. This Users' Guide is intended for beginners who want to represent their energy systems with a TIMES model. It illustrates step-by-step how to build an energy model, from the simplest case with one commodity and one technology to a complex model encompassing the entire energy system with dozens of commodities and hundreds of technologies.
3. Specific notes¹
 - Interpolation rules: <http://www.etsap.org/Docs/TIMES-Interpolate.pdf>
 - New VDA parameters: <http://www.etsap.org/Docs/TIMES-VDA.pdf>
 - Elastic demands: <http://www.etsap.org/Docs/TIMES-ED-Shaping.pdf>
 - Climate module: <http://www.etsap.org/Docs/TIMES-Climate-Module.pdf>

¹ Information on these topics is also available in the "Getting started" guide or in the MARKAL/TIMES documentation reports.

Applications (non-exhaustive list)

Global Models

<http://www.etsap.org/applicationGlobal.asp>

4. Labriet, M., Loulou, Kanudia. 2008. Is a 2 degrees Celsius warming achievable under high uncertainty? Analysis with the TIMES integrated assessment model. Cahier du GERAD, G-2008-30, 29p.
<http://www.gerad.ca/fichiers/cahiers/G-2008-30.pdf>
Stochastic analysis of climate policies with ETSAP-TIAM (TIMES Integrated Assessment Model).
5. Drouet L., Vielle M., Labriet M. and R. Loulou. 2008. A master program that will drive the coupling of GEMINI-E3 and MARKAL/TIMES models. Working paper.
<http://gemini-e3.epfl.ch/webdav/site/gemini-e3/shared/A%20master%20program%20that%20will%20drive%20the%20coupling%20of%20GEMINI-E3%20and%20MARKAL%20TIMES%20models>
Discussion on the coupling of techno-economic MARKAL/TIMES model to a computable general equilibrium GEMINI-E3 model.
6. Vaillancourt, K., Labriet, M., Loulou, R. and J-P. Waaub. 2007. The Role of Nuclear Energy in Long-Term Climate Scenarios: An Analysis with the World-TIMES model. Cahier du GERAD, G-2007-29, 26 p.
<http://www.gerad.ca/fichiers/cahiers/G-2007-29.pdf>
Analysis of the future role of nuclear energy with the World TIMES model.
7. Syri S., Lehtilä A., Savolainen I. and T. Ekholm. 2007. Global energy and emissions scenarios for effective climate change mitigation - Modelling study with the ETSAP/TIAM model. VTT Technical Research Centre of Finland.
http://www.etsap.org/Applications/VTT_scenarioreport.pdf
8. International Energy Agency (Gielen D). 2006. Energy Technology Perspectives 2006, Scenarios & Strategies to 2050 (2008 version will be available on June 6th)
<http://www.iea.org/Textbase/npsum/enertech2006SUM.pdf> (summary)
<http://www.iea.org/Textbase/nptoc/enertech2006TOC.pdf> (table of contents)
Use of MARKAL for policy analysis based on a detailed representation of technology options.
9. Biberacher M. 2006. Fusion in the global energy system – GIS and TIMES
<http://www.etsap.org/Docs/Fusglob.pdf>
Example of linkage between TIMES and a Geographic Information System
10. Labriet M. 2005. Greenhouse Gas Abatement: Techno-Economic Modeling of Global Cooperative and Non-Cooperative Scenarios. PhD Thesis, UQAM, Canada.
Last chapter available at: <http://www.gerad.ca/fichiers/cahiers/G-2005-07.pdf>
Full thesis available upon request.
Example of linkage between the World integrated MARKAL and game theory in order to define globale climate policies.

Regional Models

<http://www.etsap.org/applicationRegional.asp>

11. Pan European TIMES model (PEM) used within the New Energy Externalities Development for Sustainability (NEEDS) project.
<http://www.needs-project.org/>
<http://www.etsap.org/Applications/NEEDS-TIMES-PEM-summary-MB.pdf>

12. Alfstad T. 2005. Development of a least cost energy supply model for the Southern African Development Community region. Thesis, University of Cape Town.
<http://www.etsap.org/Docs/ERC%20SADC%20energy%20supply%20model.pdf>
13. Mäkelä J. 2000. Development of an Energy System Model of the Nordic Electricity Production System. Thesis, Hlesinki University of Technology.
<http://www.etsap.org/Docs/Times-Nordic-DiplArbeit-Jussi-1.pdf>

National Models

<http://www.etsap.org/applicationNational.asp>

14. System for the Analysis of Global Energy Markets (SAGE) used by the Energy Information Administration, US Dept of Energy, for the International Energy Outlook.
<http://www.eia.doe.gov/oiaf/ieo/>
15. Strachan N., Kannan R., and S. Pye. 2007. Final report on DTI-DEFRA scenarios and sensitivities, using the UK MARKAL and MARKAL-MACRO energy system models. Prepared for the Dept of Trade and Industry (DTI) and the Dept of Environment, Food and Rural Affairs (DEFRA). Policy Studies Institute & UK Energy Research Centre
http://www.ukerc.ac.uk/Downloads/PDF/U/UK_MARKAL_3rd_final_report_FINAL.pdf
16. Labriet M, Cabal H., Caldés N. and Y. Lechón. 2007. Future Energy Policies in Spain given the European Energy and Climate Policy Framework. International Energy Workshop, Stanford, USA, June 25-27, 2007.
<http://www.ciemat.es/portal.do?TR=A&IDR=1&identificador=2089>
17. Simões S., Cleto J., Fortes P. And J. Seixas. Estimate of CO2 Marginal abatement costs for Portugal using the TIMES_PT model.
<http://www.etsap.org/Applications/PortugalMAC.ppt>
18. Das A. and E. Ahlgren. 2007. Analysis of the impact of enhanced use of renewable and advanced fossil fuel technologies for power generation in Indonesia, Philippines and Vietnam and development of appropriate policies and institutional frameworks. Chalmers University of Technology, Sweden, 33 p.
<http://www.etsap.org/Docs/Chalmers-EC-Asean-2007-summary.pdf>
19. Blesl M. 2006. The role of CHP and district heating in Europe (CASCADE-MINTS).
http://www.etsap.org/Applications/Blesl_Seoul-role-of-CHP-DH.pdf
20. Chen W. 2005. The costs of mitigating carbon emissions in China: findings from China MARKAL-MACRO modeling.
<http://www.etsap.org/Applications/cwyEPMarkalMacro.pdf>
21. Barreto L. 2001. Technological Learning in Energy Optimisation Models and Deployment of Emerging Technologies. PhD. Swiss Federal Institute of Technology.
<http://www.etsap.org/Docs/BARRETO-thesis.pdf>

ETSAP Reports

22. Final Report Annex VIII (2002-2005): Exploring Energy Technology Perspectives
http://www.etsap.org/FinReport/ETSAP_Annex8_FinalReport_Rev5.pdf
23. Final Report Annex VII (1999-01): Contributing to the KYOTO Protocol
<http://www.etsap.org/reports/annex7.pdf>