

# ANSWER-TIMES

## Version 6.8.1 software update ANSWER-TIMES “Getting Started” Manual

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## Recent History

- ◆ *Last ANSWER-TIMES update presentation at an ETSAP Meeting?*
  - *Athens Meeting, November 2011, delivered by Gary Goldstein on my behalf*
- ◆ *ANSWER-TIMES v6.7.2 enhancements had been released one month earlier, providing:*
  - *New ANSWER-TIMES “Smart” Excel Workbook Facility*
  - *Support for new TIMES Early Retirement of Capacity Extension*
  - *User-defined Constraint Marginals and Levels available in ANSWER-TIMES Results*
  - *Database Utopia\_Demo\_UC\_Data.mdb containing non-BASE scenarios demonstrating 6 types of non-dynamic TIMES User-Defined Constraints*
- ◆ *Around the same time, first production version of ANSWER-TIMES Library Region had been created for TIMES-ETP, used for ETP-2012*



## Recent ANSWER-TIMES Updates - 1

- ◆ **ANSWER-TIMES version 6.7.5, released March 2012**
  - *Additional Online Results Parameters (Levels and Marginals for TIMES variables)*
  - *Documentation for "TIMES Elastic Demand Extension in ANSWER-TIMES" revised and expanded*
  - *A few new TIMES Data Parameters and Switches supported*
  - *Using ANSWER-aware TIMES GAMS code version 3.3.3(a)*
- ◆ **ANSWER-TIMES version 6.7.9, released December 2012**
  - *"Smart" Excel Workbook Facility updated to handle Excel 2007+ XLSM files*
  - *Stochastic implementation revised to allow up to 300 "states of the world"*
  - *Enhanced Case Management: New Case, Copy Case and (full) Edit Case*
  - *Two new TIMES Data Parameters and Switches supported*
  - *Using ANSWER-aware TIMES GAMS code version 3.3.8*



## Recent ANSWER-TIMES Updates - 2

- ◆ **ANSWER-TIMES version 6.8.1, released September 2013 - Summary**
  - *Support for working with recently enhanced TIMES-MACRO-MSA Extension*
    - *Considerable assistance from Antti Lehtila, VTT*
  - *New manual "Using VEDA-BE with ANSWER-TIMES" released*
    - *Gary Goldstein of DecisionWare Group played a pivotal role*
  - *A few new TIMES Data Parameters supported*
    - *Including ACT\_FLO (alias for VDA\_FLOP), NCAP\_START*
  - *A number of topology-related enhancements implemented*
  - *New document "Handling of Trade Processes in ANSWER-TIMES, Additional Information"*
  - *Some other interface enhancements*
  - *Some bug fixes*
  - *Using ANSWER-aware TIMES GAMS code (most recent) version 3.4.5*



## Some details re ANSWER-TIMES v6.8.1 Update - 1

### ◆ Support for working with TIMES-MACRO-MSA Extension

#### ➤ Modifications to Run Model:

**Model Variant and Objective Function Specification**

TIMES Model Variants and Objective Function Options for Case 'MACRO-POL-MSA' are displayed in Edit mode.

**Model Variants**

No Elastic Demand     Save Base Prices for Elastic Demand     Elastic Demand (Reading Base Prices)

Climate

No Damages in Objective     Damages in Objective LP     Damages in Objective NLP

Discrete Capacity Investment

No Capacity Retirement     Continuous Capacity Retirement     Discrete Capacity Retirement

Endogenous Technology Learning (Beta)

No MACRO     MACRO Calibration     Policy Run (MACRO MSA)     Policy Run (Standard MACRO)

No Stochastic/Tradeoff     Stochastic     Tradeoff/Sensitivity Analysis

Fix Initial Periods (FIXBDH)    Fix Up To:     Restart GDX File:

Time-Stepped Solve    TimeStep:     Overlap:

**Objective Function Options**

DBI Formulations:  AUTO     STD     MOD     ALT     LIN    Discounting:  Start of Year     Middle of Year     End of Year

Optimizer: LP + NLP    Model Variant Description: MacroPolicyMSA   



## Some details re ANSWER-TIMES v6.8.1 Update - 2

#### ➤ Modifications to MACRO Data Parameters (Parameter tab):

**Global | TimeSlice | Commodity | CommGroup | Process | TradeProcess | Constraint | Stochastic | Parameter**

Items Filter:  Normal     Sets     Macro Data Parameters   

Name	Description
TM_ARBM	Multiplier for last period length
TM_DEPR	Depreciation rate
TM_DMTOL	Demand lower bound factor
TM_ESUB	Elasticity of substitution
TM_EXPEND	Market Penetration Cutoff for Applying Cost Penalty (not used in TIMES-MSA)
TM_EXPF	Annual percent expansion factor (not used in TIMES-MSA)
TM_GDP0	GDP in the first period
TM_GR	MACRO projected annual GDP growth
TM_IVETOL	Investment and energy tolerance

Scenario	Parameter	Region	Process	I/E	1990	2000
M	MACRO-PARAMS	TM_GR	REG	-	0	2.5000
Add	MACRO-PARAMS					

Scenario	Parameter	Region	Value
M	MACRO-PARAMS	TM_ARBM	1.0000
M	MACRO-PARAMS	TM_DEPR	5.0000
M	MACRO-PARAMS	TM_DMTOL	0.5000
M	MACRO-PARAMS	TM_ESUB	0.2500
M	MACRO-PARAMS	TM_GDP0	8.629.7000
M	MACRO-PARAMS	TM_IVETOL	0.5000
M	MACRO-PARAMS	TM_KGDP	2.5000
M	MACRO-PARAMS	TM_KPVS	0.2500
M	MACRO-PARAMS	TM_SCALE_CST	0.001000
Add	MACRO-PARAMS		

**Set Memberships Items Filter - Data Parameters**

Select a parent/leaf node from the Set Memberships Additional Characterization list

**Set Memberships**

- Data Parameter
  - Data Parameter, Excl. TIMES Extensions
  - Climate Data Parameter
  - Damage Data Parameter
  - Discrete Investment Data Parameter
  - Elastic Demand Data Parameter
  - ETL Data Parameter
  - FIXBDH, Time-Stepped Data Parameter
  - MACRO Data Parameter**
  - Retirement of Capacity Data Parameter
  - Stochastic Data Parameter



## Some details re ANSWER-TIMES v6.8.1 Update - 3

- *TIMES-MACRO-Demo.MDB* created so user can step through mechanics:

The screenshot shows the ANSWER-TIMES Energy Modelling software interface. It features a menu bar (File, Edit, View, Run, Tools, Functions, Help) and a toolbar with icons for Region Management and Batch Management. The main window is divided into two sections: Data Management and Results Management.

**Data Management**

Name	Description	Created
_DELETED	Items deleted from Data that occur in Results	2012/11/05 17:09
BASE	Basic TIMES Model	2012/11/05 17:09
MACRO-PARAMS	MACRO parameters	2012/12/15 21:16
MACRO-POLICY	MACRO Policy scenario	2012/12/17 12:11

**Results Management**

Name	Description	Scenario	Created
BASIC-MODEL	Basic TIMES model, run with \$SET OBLON...	BASE	2013/01/27
MACRO-CALIB	MACRO Calibration Run, run with \$SET OBL...	BASE+MACRO-PARAMS	2013/01/27
MACRO-POL-MSA	MACRO Policy Run using MSA, run with \$S...	BASE+MACRO-PARAMS+MA...	2013/01/27
MACRO-POL-STD	MACRO Policy Run using Standard MACRO...	BASE+MACRO-PARAMS+MA...	2013/01/27

- Document *"TIMES-MACRO Extension in ANSWER-TIMES"* created, to be read in conjunction with ETSAP document *TIMES-Macro-MSA.pdf*



## Some details re ANSWER-TIMES v6.8.1 Update - 4

- ◆ *New manual "Using VEDA-BE with ANSWER-TIMES" (24 pages)*

Using VEDA-BE with ANSWER-TIMES	
June 2013	
Noble-Soft Systems Pty Ltd and DecisionWare Group LLC	

  

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## Some details re ANSWER-TIMES v6.8.1 Update - 5

### ◆ A few new TIMES Data Parameters supported

- **ACT\_FLO** (alias for VDA\_FLOP): Flow of commodity / sum of flows of CG commodities per unit of process activity. VEDA has long utilized the VDA\_FLOP parameter.
- **NCAP\_START**: Start year for new investments in capacity. This parameter is not part of “official” TIMES. I asked Antti Lehtila to enhance the TIMES GAMS code so that it could be used in ANSWER as a short-cut for TIMES parameter PRC\_NOFF (periods for which new capacity can NOT be built).
  - $NCAP\_START(reg,prc) = y$  is a short-cut for  $PRC\_NOFF(reg,prc,BOH,y-1) = 1$

Scenario	Parameter	Region	Process	Commod	CommGro	Com	Item5	Item6	I/	1990	2000	2010	2015
BASE	ACT_COST	?	REG	E21	-	-	-	-	0	1.5000	1.5000	1.5000	1.5000
BASE	ACT_EFF	?	REG	E21	-	URN	-	ANNUAL	0	0.4000	0.4000	0.4000	0.4000
BASE	NCAP_AF	?	REG	E21	-	-	-	ANNUAL	LIP	0	0.800000	0.800000	0.800000
BASE	NCAP_COST	?	REG	E21	-	-	-	-	-	5,000.0000	5,000.0000	5,000.0000	5,000.0000
BASE	NCAP_FOM	?	REG	E21	-	-	-	-	-	500.0000	500.0000	500.0000	500.0000
BASE	NCAP_TLIFE	?	REG	E21	-	-	-	-	-	40	40	40	40
Add	BASE	?	?	?	?	?	?	?	?				

  

Scenario	Parameter	Region	Process	Commod	Item3	Year	Item5	Item6	Value
BASE	NCAP_START	?	REG	E21	-	-	-	-	2,000
BASE	PRC_ACT_TONN	?	REG	E21	-	-	-	-	-
BASE	PRC_CAPACITY	?	REG	E21	-	-	-	-	31.5400
BASE	PRC_NOFF	?	REG	E21	-	-	BOH	1990	1
BASE	TOP-IN	?	REG	E21	URN	-	-	-	1
BASE	TOP-OUT	?	REG	E21	etc	-	-	-	1
Add	BASE	?	?	?	?	?	?	?	



## ANSWER-TIMES “Getting Started” Manual

### ◆ Version 1.1 completed end of October 2013

### ◆ Overview of the “Getting Started” Manual:

- Section 1, Introduction
- Section 2, Using ANSWER-TIMES to build and run a tiny TIMES model
- Section 3, Using ANSWER-TIMES to build more sophisticated TIMES models
- Section 4, Appendix A - Getting Started with the Problem – Defining and Describing the Area of Study (Author: Dr GianCarlo Tosato)
- Size of manual? 124+34
- 3 demonstration ANSWER-TIMES databases accompany manual to make concrete assorted aspects of Section 3

### ◆ “Interesting” parts of the Manual:

- Sub-section 3.2, Overview of the different types of ANSWER-TIMES Documentation
- Sub-section 3.3.7, Process Tab – Processes & associated Data Parameters



## 3.2 Overview of different types of ANSWER-TIMES Documentation

- ◆ **Manuals in folder C:\AnswerTIMESv6\UserManuals**
  - *ANSWERv6-TIMES User Manual.pdf (March 2009, 342 pages)*
  - *ANSWERv6-TIMES Smart Excel Workbook Manual.pdf (39 pages)*
  - *ANSWERv6-TIMES Smart Excel Workbook Manual (Excel 2007 and higher).pdf (40 pages)*
  - *Using VEDA-BE with ANSWER-TIMES.pdf (24 pages)*
- ◆ **Software Update documents in folder C:\AnswerTIMESv6\Doc**
- ◆ **Documents re use of ANSWER-TIMES for TIMES Model Variant Extensions**
  - *TIMES-MACRO Extension in ANSWER-TIMES*
  - *TIMES Stochastic Programming Extension in ANSWER-TIMES*
  - ...
  - *TIMES Time-Stepped Solve (TIMESTEP) Option in ANSWER-TIMES*



### 3.3.7 Process Tab – Processes & associated Data Parameters

- ◆ *How to do a nice job of introducing the richness of Process possibilities that are offered by TIMES? Specific examples? Generic examples? Both?*
- ◆ *Dr Uwe Remme kindly agreed I could use any of his TIMES training material; Dr Uwe Remme and Dr Antti Lehtila independently reviewed initial draft of this sub-section*
- ◆ **Subsection restructured to incorporate most of their suggestions:**

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◆ **TIMES Data Parameters Applying Only to, Not Applying to, Types of TIMES Processes**

Type of Process	TIMES Data Parameters that apply only to this Type of Process	TIMES Data Parameters that cannot be used for this Type of Process
Standard Process, not CHP Process		All IRE_* and STG_* parameters, NCAP_CEH, NCAP_CHPR
Combined Heat & Power Process (CHP)	NCAP_CEH, NCAP_CHPR (Parameters NCAP_CEFF, NCAP_BPME are associated with a very old TIMES CHP implementation and should not be used)	All IRE_* and STG_* parameters
Inter-regional Exchange (Trade) Process (IRE)	IRE_BND, IRE_FLO, IRE_FLOSUM-IN, IRE_FLOSUM-OUT, IRE_PRICE, IRE_XBND	ACT_EFF, ACT_FLO, FLO_FR, FLO_FUNC, FLO_SUM, FLO_SHAR, NCAP_CEH, NCAP_CHPR, UC_FLO, STG_*
Storage Process (STG)	STG_CHRG, STG_EFF, STG_LOSS, STGIN_BND, STGOUT_BND	ACT_EFF, ACT_FLO, FLO_CUM, FLO_SUM, FLO_SHAR, NCAP_CEH, NCAP_CHPR, IRE_* ; FLO_BND, FLO_FR, FLO_FUNC, UC_FLO only for auxiliary flows

- **Column 3 kindly provided by Dr Antti Lehtila**
- **How would you have fared filling in column 3 of this table?**



## Acknowledgments

- ◆ **ANSWER-TIMES version 6.8.1 update**
  - **Antti Lehtila, VTT Energy Finland, for his continued generous assistance, in particular with advice re TIMES-MACRO-MSA Extension**
  - **Gary Goldstein, DecisionWare Group, for suggesting that there should be a "Using VEDA-BE with ANSWER-TIMES" manual, for creating the first draft and for building the AT\_VBE-Example4 VEDA-BE database**
- ◆ **ANSWER-TIMES "Getting Started" Manual**
  - **Uwe Remme, IEA Paris, for generously making available assorted TIMES training material that he has developed, and for closely reviewing section 3.3.7 on Processes**
  - **Antti Lehtila, VTT Energy Finland, for closely reviewing section 3.3.7 on Processes**
  - **ETSAP, for providing funding assistance to Noble-Soft Systems**



## Related Issue: Deficiencies in ETSAP Documentation

Documentation for the TIMES Model

PART II

April 2005

- ◆ *Important new features and options added to TIMES since 2005, and a lot of experience gained*
- ◆ *Essential to consolidate ETSAP documentation and recommend best ways of using new features and best (default) options*
  - *E.g. best practice for specifying TIMES processes (use of ACT\_EFF, FLO\_EMIS etc) especially CHP, Storage*
  - *E.g. best practice for objective function options (default OBJ AUTO?, default Middle of Year?)*
- ◆ *Unnecessarily difficult for new users*