

ANSWER-TIMES

Version 6.7.2 software update
Special Library Region Version for TIMES-ETP

Ken Noble

Noble-Soft Systems, Australia

ETSAP Annex XI Meeting

Athens, Greece

9 November 2011



Summary of ANSWER-TIMES v6.7.2 Enhancements - 1

- ◆ *Released 19 October 2011*
- ◆ *Supports most parameters & switches in ETSAP TIMES GAMS code v3.2.0*
 - Previous version of ANSWER-TIMES v6.6.8 was distributed with ANSWER-aware TIMES GAMS code v3.1.2
 - ANSWER-aware TIMES GAMS code v3.3.1 is now available (contact Noble-Soft), supports new experimental stochastic parameters S_COM_FR, S_NCAP_AFS
- ◆ *New ANSWER-TIMES “Smart” Excel Workbook Facility*
 - Similar format to “New” format for Import Model Data from Excel, but with “smart” buttons in first 7 rows on each worksheet to assist user in assembly of model data
 - *ANSWERv6-TIMES Smart Excel Workbook Manual.pdf* provides detailed documentation
 - Some significant differences from ANSWER-MARKAL “Smart” Load Templates:
 - REGIONS, ITEMS, TS DATA, TID DATA, TS&TID DATA, TS TRADE, TID TRADE, TS&TID TRADE sheets – each with [Check Sheet] button
 - Item arguments of Data Parameters can be selected from associated database, as well as from ITEMS sheet
 - More powerful filtering options for Parameter and Item argument selection



ANSWER-TIMES “Smart” Excel Workbook ITEMS Sheet with “smart” buttons

1	A	B	C	D	E	F	
2	ITEMS	GLOBAL,REG1,REG2,REG3,IMPEXP,MINRWW					
3	Check Sheet						
4		Component				Unit(s)	Set Memberships
5							
6							
7		Comp	Name	Description	Unit(s)	Set Memberships	
54		* Process Items for REG1,REG2,REG3 regions					
56		REG1,REG2,REG3	T	E01	Coal Steam Electric	PJ,GW	PRC,ELE,DAYNITE
57			T	E21	LWR Nuclear Plant	PJ,GW	PRC,ELE,SEASON
58			T	E31	Hydro-electric Plant		
59			T	E41	Natural gas combined-c		
60			T	E51	Pumped Storage Power		
61			T	E70	Oil Plant		
62			T	RHE	Electric Boiler		
63			T	RHG	Gas/oil Boiler		
64			T	RHH	District Heat Exchanger		
65			T	RHO	Diesel Boiler		
66			T	RL1	Standard Incandescent L		
67			T	SRE	Oil Refinery		
68			T	TYD	Diesel Car		
69			T	TYE	Electric Car		
70			T	TXG	Gasoline Car		
71							

Specify Process Set Memberships

To specify Set Memberships, click on the appropriate leaf node in the LHS treeview, adjust the RHS Additional Characterization as necessary, and then click on the OK button.

Set Memberships

- Process (PRC)
- Combined Heat & Power (CHP)
- Demand Device (DMD)
- Electric Generation (ELE)
- Energy (PRE)
- Heat Generation (HGT)
- Material (By weight) (PRV)
- Material (By volume) (PPV)
- Miscellaneous (MISC)

Additional Characterization

- Annual Time Slice Level
- Seasonal Time Slice Level
- Weekly Time Slice Level
- Day-Night Time Slice Level
- Distribution System (DISTR)
- Import/Export (PRE)
- High Storage (NST)
- Storage, not NST or STK (STGTSS)

OK Cancel

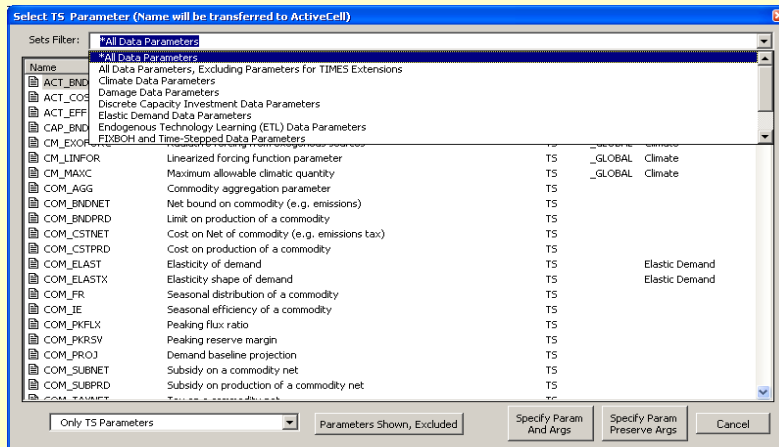


ANSWER-TIMES “Smart” Excel Workbook TS DATA Sheet with “smart” buttons

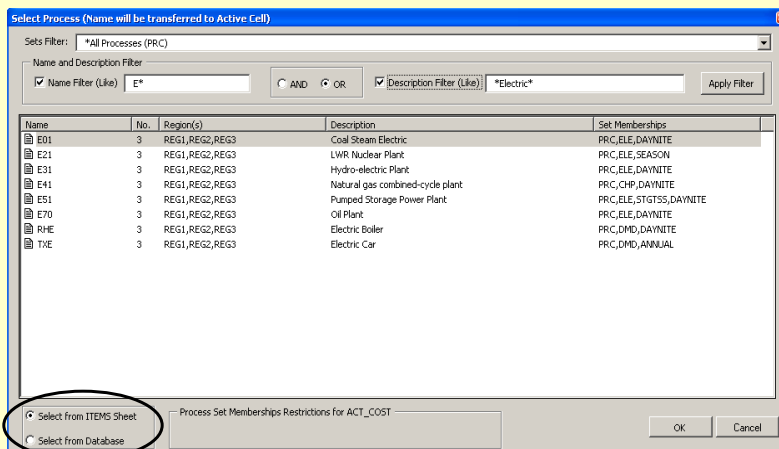
1	A	B	C	D	E	F	G	H	I	J	K	L
2	TS DATA	GLOBAL,REG1,REG2,REG3,IMPEXP,MINRWW										
3	Check Sheet											
4		Parameter	Arg1	Arg2	Arg3	Arg4	Arg5	Arg6	I/E Opt			
5												
6												
7		Parameter	Arg1	Arg2	Arg3	Arg4	Arg5	Arg6	I/E Opt			
8												
9		* TS Process Data for non-Demand Devices, Grouped by Process - REG1,REG2,REG3 regions										
10		REG1,REG2,REG3	ACT_COST	E01	-	-	-	-	0	0.3	0.3	0.3
11			ACT_EFF	E01	-	HCO	-	ANNUAL	0	0.32	0.32	0.32
12			FLO_EMIS	E01	CO2	HCO	-	ANNUAL	0	89	89	89
13			NCAP_AFA	E01	-	-	-	UP	0	0.8	0.8	0.8
14			NCAP_COST	E01	-	-	-	-	0	1400	1300	1200
15			NCAP_FOM	E01	-	-	-	-	0	40	70	100
16			NCAP_TLIFE	E01	-	-	-	-	0	40	40	40
17	*											
18			ACT_COST	E21	-	-	-	-	0	1.5	1.5	1.5
19			ACT_EFF	E21	-	URN	-	ANNUAL	0	0.4	0.4	0.4
20			NCAP_AF	E21	-	-	-	ANNUAL	UP	0	0.8	0.8
21			NCAP_COST	E21	-	-	-	-	0	5000	5000	5000
22			NCAP_FOM	E21	-	-	-	-	0	500	500	500
23			NCAP_TLIFE	E21	-	-	-	-	0	40	40	40
24	*											



ANSWER-TIMES “Smart” Excel Workbook Parameter Selection Form with Sets Filter



ANSWER-TIMES “Smart” Excel Workbook Item Argument Selection with Sets Filter, Name/Description Filter Select from ITEMS Sheet or Select from Database



Summary of ANSWER-TIMES v6.7.2 Enhancements - 2

- ◆ **Support for new *TIMES* Early Retirement of Capacity Extension:**
 - Specified processes can be allowed to retire before the end of their life
 - Retirements may be continuous or lumpy
- ◆ **New checkbox `Generate Files, Do Not Run` available with Batch Run facility**
 - Allows user to create Batch Run files, then copy files to and carry out Batch Run on a more powerful computer
- ◆ **User-defined Constraint Marginals and Levels now available in ANSWER-TIMES online Results**
- ◆ **Database *Utopia_Demo_UC_Data.mdb* contains non-BASE scenarios demonstrating 6 types of non-dynamic *TIMES* User-Defined Constraints**
- ◆ **New Data Parameters combobox setting “All Data Parameters, Excluding Parameters for *TIMES* Extensions”**
 - Simplifies Data Parameter selection by excluding 70+ Parameters that are relevant only for *TIMES* Extensions



Special ANSWER-TIMES Library Region version for *TIMES*-ETP

- ◆ **IEA’s *Energy Technology Perspectives (ETP)* model has for some years been run using a special Library Region version of ANSWER-MARKAL**
 - Most recently used for ETP-2010
- ◆ **For ETP-2012, IEA will use *TIMES*, so ETP model has been converted from MARKAL to *TIMES* to create *TIMES*-ETP, and a special Library Region version of ANSWER-TIMES has been created for *TIMES*-ETP**
- ◆ **Overall aim is to handle a large multi-region model with common naming conventions across regions for TimeSlices, Commodities, Commodity Groups, Processes, User-Defined Constraints**



ANSWER-TIMES Library Region – Overview - 1

- ◆ **Special Library Region contains Parent Items**
 - TimeSlices, Commodities, Commodity Groups, Processes, Trade Processes, User-Defined Constraints
- ◆ **Internal Regions, also called Local Regions, contain Child Items that inherit their attributes from their Parent in Library Region**
 - Child Item has same Name, Description, Set Memberships, Units as its Parent
 - By default Child Item has same TS and TID Data Parameters, with same numeric values, as its Parent Item
 - User can update numeric values for Data Parameters associated with Parent Items, and then apply a single update operation that updates numeric values for Data Parameters associated with Child Items to match Parents' values



ANSWER-TIMES Library Region – Overview - 2

- ◆ **For Process Parameters, so-called Operator Parameters allow numeric values for Child Item Parameters in Local Regions to be derived from numeric values of Parent Item by multiplication (x) or addition (+)**
 - Override (O) of Parent Item numeric values is also an option

A screenshot of the 'Edit Operator Parameter' dialog box. The title bar reads 'Edit Operator Parameter'. Below the title bar, there is a folder icon and the text 'Edit Name or Description or Operator or other attributes for Operator Parameter' and 'NCAP_COST_MULT: NCAP_COST Multiplier'. The dialog has several fields: 'Name' with 'NCAP_COST_MULT', 'Description' with 'NCAP_COST Multiplier', and 'Operator' with a dropdown menu showing 'x'. Below this, there is a 'TIMES Process Parameter' dropdown with 'NCAP_COST' selected and its description 'Investment cost for new capacity'. There is also a 'Process Filter' dropdown with 'CC1_ALL' and 'CC1 Demand technologies' selected, and a 'Named Filter...' button. At the bottom, there are three input fields: 'Decimal Places' with '4', 'Default Value' with '1', and 'Default I/E Optcode' with '0'. 'OK' and 'Cancel' buttons are at the bottom right.

ANSWER-TIMES Library Region – Overview - 3

◆ Specify multiplier (x) for each local region

Scenario	Parameter	Region	I/E	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
BASE	NCAP_COST_MULT	AUS	?	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
BASE	NCAP_COST_MULT	EEU	?	1.2000	1.2000	1.2000	1.2000	1.2000	1.2000	1.2000	1.2000	1.2000	1.2000	1.2000
BASE	NCAP_COST_MULT	FSU	?	1.0500	1.0500	1.0500	1.0500	1.0500	1.0500	1.0500	1.0500	1.0500	1.0500	1.0500
BASE	NCAP_COST_MULT	IND	?	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
BASE	NCAP_COST_MULT	JPN	?	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
BASE	NCAP_COST_MULT	USA	?	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
BASE	NCAP_COST_MULT	wEU	?	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Add	NCAP_COST_MULT		?	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Apply update operation: local region NCAP_COST values show effect of x

Scenario	Parameter	Region	Process	Com	CommGroup	CommG	Item5	Item6	I/E	2000	2005	2010	2015
BASE	NCAP_COST	LIBRARY	CC1DST000	-	-	-	-	-	0	95.0000	95.0000	95.0000	95.0000
x	NCAP_COST	AUS	CC1DST000	-	-	-	-	-	0	104.5000	104.5000	104.5000	104.5000
x	NCAP_COST	EEU	CC1DST000	-	-	-	-	-	0	114.0000	114.0000	114.0000	114.0000
x	NCAP_COST	FSU	CC1DST000	-	-	-	-	-	0	99.7500	99.7500	99.7500	99.7500
BASE	NCAP_DRATE	LIBRARY	CC1DST000	-	-	-	-	-	0	0.1420	0.1420	0.1420	0.1420



Acknowledgments

- ◆ Antti Lehtila, VTT Energy Finland, for his continued generous assistance, in particular with our joint work on the TIMES Early Retirement of Capacity facility
- ◆ Uwe Remme, IEA Paris, for his continued generous encouragement, and for contributing a number of ideas to the development of the “Smart” Excel Workbook Facility
- ◆ International Energy Agency, Paris, for funding development of the special Library Region version of ANSWER-TIMES
- ◆ GianCarlo Tosato, ETSAP Project Head, for providing funding assistance to Noble-Soft Systems
- ◆ Intelligent Energy Systems, Sydney, for providing funding assistance re development of the TIMES Early Retirement of Capacity facility
- ◆ Gary Goldstein, DecisionWare, for presenting these slides on my behalf

