ANSWER-TIMES Overview

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Presentation Outline

• Similarities between ANSWER-TIMES and ANSWER-MARKAL
• TIMES differences from MARKAL affecting ANSWER
• Data year – model year independence
• Managing input data
• Specifying a Rule-based User Constraint
• Running a Model
• Model Results
• Status Summary
• Future Developments
• Acknowledgments
Similarities between ANSWER-TIMES and ANSWER-MARKAL
(Home Screen appears identical, a few facilities invoked from Home Screen differ)

| Data Screen identical paradigm, most facilities identical, some tabs different names |

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**Noble-Soft Systems**

**ANSWER Energy Modeling Software**

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Similarities between ANSWER-TIMES and ANSWER-MARKAL

(New/Edit Item identical for TimeSlice, Commodity, CommGroup, Constraint Items)

Similitudes entre ANSWER-TIMES et ANSWER-MARKAL

(Run Model form is very similar, but note [Specify Milestone Years] button)

Specify Milestone Years button replaces End Year combobox
TIMES differences from MARKAL affecting ANSWER

◆ TIMES supports data year – model year independence so model run periods (Milestone Years) can differ from data periods
  ➢ Both data periods and model run periods can have unequal spacing
◆ TIMES distinguishes Internal and External Regions
◆ TIMES “Commodity Group” concept has no analogue in MARKAL, also adds complexity to Process definition
◆ TIMES allows a much richer set of user-defined Constraint options
◆ TIMES handles Trade between regions differently from MARKAL
◆ Of course TIMES has differently named Sets, and differently named Data Parameters and Results Parameters
  ➢ Some TIMES Data Parameters have as many as 6 arguments

Data Year – Model Year Independence
Revamped “New Database” form

Result years comprise allowable Milestone Years in model runs
Data Year – Model Year Independence

Results Screen showing results years 2000, 2005, 2010, 2020, ...
Process tab – New Process form
Special I/O Commodities tab to allow specification of I/O Commodities, PCG

After exiting New Process form
Process tab – For new process REFINERY, auto-generation of PRC_ACTUNT, PRC_CAPACT and topology (TOP) from I/O Commodities

CommGroup tab - Auto-generation of “true” PCG REFINERY-G and of REFINERY-G COM_GMAP instances for CRUDE-OIL1 and CRUDE-OIL2
Special Traded Commodities tab to allow specification of Traded Commodities

Auto-generation of Trade Process for each region involved in trade, and of TOP_IRE
Specify Rule-based User Constraint - 1

*Electric car at least 10% of automobile transport demand*

1. Define TechFilter ALLTRN_DMD to select all automobile transport DMDs

Specify Rule-based User Constraint - 2

2. Define Rule-based Constraint, using UCRULE_ACT and TechFilter ALLTRN_DMD
Specify Rule-based User Constraint - 3

3. Resolve Rule-based Constraint
(to check we got it right)

Run Model Form with new [Specify Milestone Years] button
After selecting Milestone Years, 3 different options for auto-generating B and E
Model Results – Parameter Tab
Right now comprise Detailed Flow Levels and Marginals, and Aggregate Costs

TIMES does not have standard Results tables (c.f. MARKAL)
Right now, use VEDA-BE for other sorts of results aggregation

Model Results – Process Tab
Results Parameters may also be viewed on other tabs, e.g. Process tab
ANSWER-TIMES Status Summary Nov 2007 – 1

◆ **Data year – model year independence supported**
  - New Data years and new Model years can be added later as well

◆ **All standard TIMES Sets and Parameters in latest v2.4.0 TIMES GAMS code recognized**
  - Also some VDA extension parameters supported (ACT_EFF, FLO_EMIS, NCAP_AFC, NCAP_CEH, PRC_RESID)

◆ “Run Model” enhanced to allow specification of Milestone Years, B and E and also to support GAMS Savepoint/Loadpoint (Basis Save/Restart) enhancement in TIMES GAMS code

◆ **Import TIMES GAMS DD facility has been tested with a number of TIMES GAMS DDs**
  - Run Model out of ANSWER-TIMES replicating original LP matrix and objective value, including for VEDA-FE generated DDs

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◆ **All Home Screen and Data Screen functions operational**

◆ **Process tab facilities enhanced to better handle special needs of TIMES, with new form to specify I/O commodities and PCG**
  - Including auto-generation of PRC_ACTUNT, PRC_CAPACT, TOP-JN, TOP-OUT, and “true” PCG with associated COM_GMAP where needed
  - Technology (Process) Items Filters facility available (as for ANSWER-MARKAL)

◆ **New/Edit TradeProcess form further refined to simplify Trade Matrix specification where traded Commodity has same name in all regions**

◆ **All types of TIMES User Constraints are handled, with UC_ * parameters that ANSWER-TIMES auto-generates now adjusted to be compatible with recent changes to TIMES GAMS code defaults**
  - Special _GLOBAL region handles cross-region constraints
  - Special UCMARKET constraint type for common market share bounds
  - Rule-based Constraints facility available for all types
ANSWER-TIMES Status Summary Nov 2007 – 3

◆ There is now a 16 character Item name limit
  ➢ As compared with 10 character Item name limit in ANSWER-MARKAL

◆ Results that ANSWER-TIMES imports extended to include aggregate cost results, along with option to suppress pure zero time series results
  ➢ Thanks to Antti Lehtila for enhancing the TIMES GAMS code

◆ ANSWER-TIMES results handling needs to be extended
  ➢ Have TIMES GAMS code create other aggregated results (analogous to standard MARKAL reports) and import into ANSWER?
  ➢ Right now, use VEDA-BE for results handling

◆ Preliminary ANSWER-TIMES User Manual documents the TIMES-specific aspects of ANSWER-TIMES
  ➢ Recently updated ANSWERv6-MARKAL User Manual fully documents ANSWER-MARKAL and hence documents each ANSWER-TIMES facility that operates identically to the same ANSWER-MARKAL facility

Future Developments

◆ New ANSWER-TIMES evaluation system available December 2007
◆ Add support for user-defined inter- & extrapolation options
◆ Extend ANSWER-TIMES results handling
◆ Develop ANSWER-TIMES “smart” spreadsheets by extending approach used for ANSWER-MARKAL “smart” spreadsheets
◆ Enhance New/Edit Trade Process form to handle Trade Processes that involve trade in multiple commodities, while retaining full generality of naming permitted by TIMES
◆ Streamline operation of TimeSlice specification where same TimeSlices in each region
◆ Enhance to support advanced TIMES model variants, if there appears to be a demand
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