

Recent MARKAL/ANSWER Enhancements

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Outline

◆ Major Enhancements

- MARKAL time-stepped formulation allows n-Period look-ahead {IEA-ETP support}
- ANSWER 'smart' load templates that load models from Excel spreadsheets {USAID SEE-REDP and USEPA support}

◆ Minor Improvements

- Report writer enhancements to report electricity/heat generation by timeslices and calculate the expenditure on fuel by technology {USEPA support}
- Ability to include the annual emission total variable (R_EM) in user constraints

MARKAL Time-stepped n-Period Look-Ahead

- ◆ Allows the number of periods optimized at the same time to be set by the user
- ◆ After each solve the initial period in the group is “fixed” and the next period is included
- ◆ Stepping stops once the last period is included in the group solved

- ◆ Simply set $MTS_NPRD = n\text{-Period}$ (default 1, for SAGE)



ANSWER “Smart” Template Basics

- ◆ The workbook is linked with a particular MARKAL database for unit/period, set and parameter information
- ◆ VBA “macro” enables various text, links and actions to be undertaken via “smart” buttons
- ◆ Six kinds of “smart” sheets, of two types
 - Single declaration sheet for name, description, set membership, description and units for Commodities/Technologies/Constraints
 - Any number of data sheets for Commodities/Technologies/Constraints

ANSWER “Smart” Template Basics (Cont.)

- ◆ Only those items declared are available for selection on Data sheets and pass Checking, but any may be included on the data sheet as long as already defined in the database at import time
- ◆ “Reserved” rows for column headers and specification [as established] on the data sheets
- ◆ Once an entry is made it holds on the all rows below until another entry is encountered
- ◆ Data can be provided in any (column) order

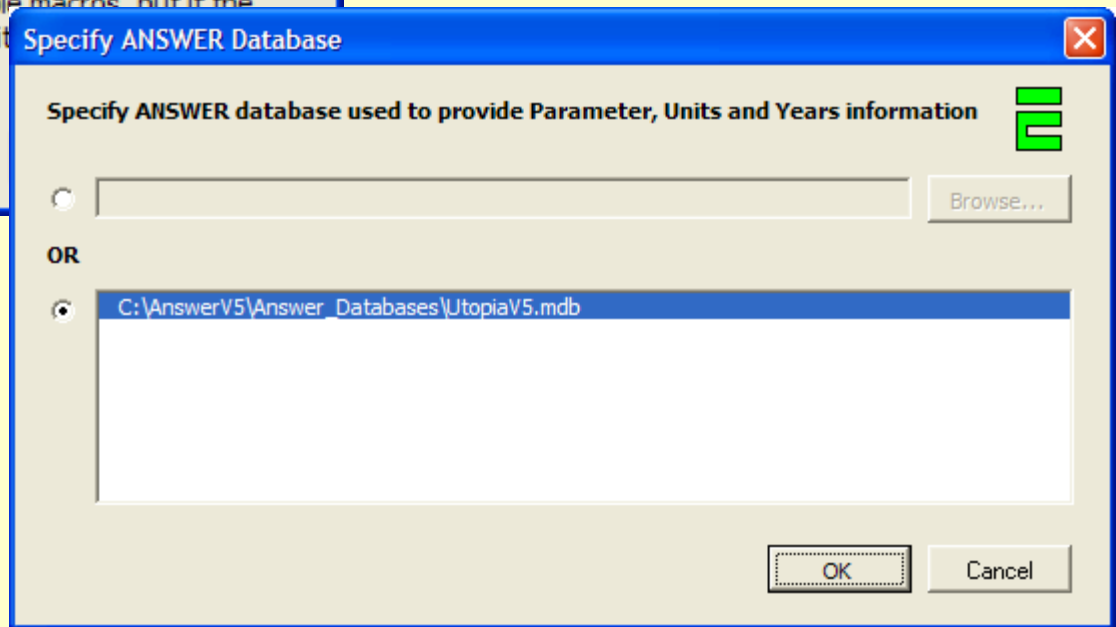
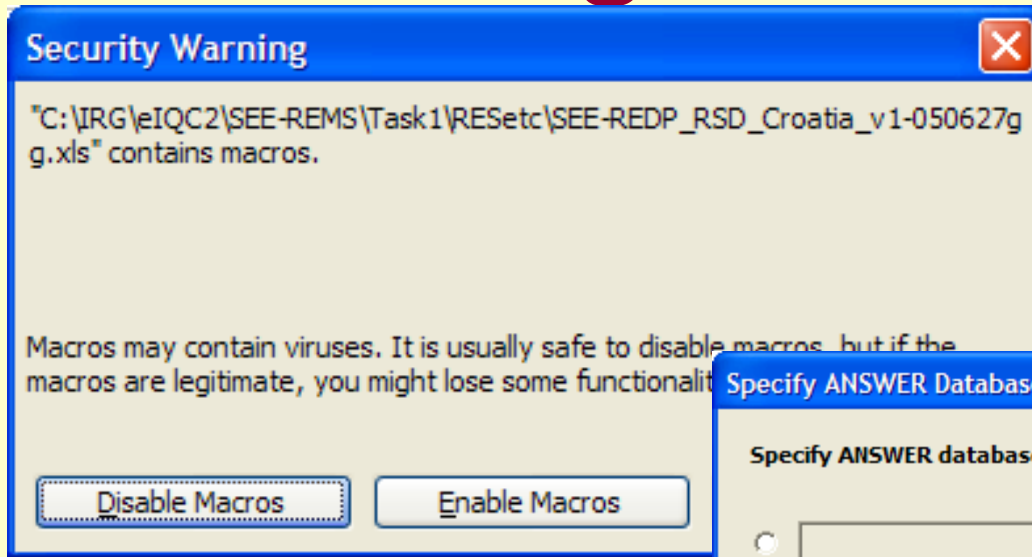


ANSWER “Smart” Template Basics (Cont.)

- ◆ Year designation may be
 - Blank for all periods
 - A single period
 - A period range (year1-year2)
- ◆ Region qualifiers by row or column
- ◆ Extensive checking of MARKAL “rules” can be done on each “smart” worksheet by means of the Check Sheet Button



Template Use – Linking with a Database



Template Use – Smart Buttons Types

<u>Button</u>	<u>Sheets</u>	<u>Description</u>
Set Membership	Declaration	Presents the ANSWER Set specification form, with the primary Tree and Additional Characteristic, for designation of set membership and thereby “position” in the RES. Form is component (commodity, technology, constraint) sensitive.
Units	Declaration	Presents the ANSWER Units specification form for selection of the appropriate units associated with the item. Form is component (commodity, technology, constraint) sensitive.
Check Sheet	All	Performs thorough Quality Control checks on the information contained in the active sheet. Checks are component (commodity, technology, constraint) sensitive. [Not cursor position sensitive.]
Name/ Description/ Units	All Data	Establishes a link from a Data sheet to the associated component declaration sheet.
Parameters	All Data	Presents the list of Parameters that are permitted according to the component type.
Qualifiers	All Data	Once a Parameters has been
Comm-In Comm-Out	Tech_Data	Establishes a link from the Data sheet to the commodity declaration sheet to identify the commodities flowing into and leaving each technology, thereby defining the topology of the RES.
TechName	Const_Data	Establishes a link from the Data sheet to the technology declaration sheet to the technologies involved in a user defined constraint. Such constraints enables a user to establish relationships between groups of technologies (e.g., min/max market share for a fuel type, renewable portfolio standards).



Template Use – Declaration “Smart” Buttons

The screenshot displays the 'Microsoft Excel - SEE-REDP_COM_Croatia_v1-050708hbdvr' window. The spreadsheet contains a table of commodity declarations with columns for 'CommName', 'CommDesc', 'CommUnit', 'Set Memberships', and 'Comment'. The 'Set Memberships' column lists various energy carrier categories like 'Standard (ENC)', 'Conservation (ECV)', 'Fossil (EFS)', etc. Three dialog boxes are overlaid on the spreadsheet:

- Set Memberships:** A tree view showing 'Energy Carrier (ENT)' with sub-items like 'Standard (ENC)', 'Conservation (ECV)', 'Fossil (EFS)', 'High-Temp Heat or Cooling (EHC)', 'Nuclear (ENU)', 'Renewable (ERN)', 'Synthetic (ESY)', 'Electric (ELC)', 'District Heat (LTH)', and 'Fossil Equivalent (FEQ)'. The 'Additional Characterization' section has radio buttons for 'Liquid (LIQ)', 'Solid (SLD)', and 'Gaseous (GAZ)'. The 'Fossil (EFS)' item is selected in the tree.
- Specify Commodity Unit:** A tree view under 'Commodity' with units like 'Billion vehicle kilometers (Bv-km)', 'Million tons (Mt)', 'Petajoules (PJ)', 'Petajoules (if ENTs being totalled are all in PJ) (PJ?)', 'Thousand tons (kt)', 'Tons (t)', 'unit of refinery (uref)', 'unit of volume for MVOs (uvol)', 'unit of weight for MWTs (uwt)', 'unit vol (if MVOs being totalled are all in uvol) (uvol?)', 'unit wt (if MWTs being totalled are all in uwt) (uwt?)', and 'unit(?) of DMs being totalled (unitDM?)'. The 'Commodity' item is selected.
- CheckSummary - WordPad:** A text window showing a summary log file created on Sunday, August 28, 2005 at 04:14 PM. The log contains the following text:


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      *** CHECK COMMODITIES SHEET (Commodities, CROATIA) ***

      Check All Commodity Names
      -----
      All of the Names in the CommName column are OK.

      Check For Duplicate Commodity Names
      -----
      There are no Duplicate Names in the CommName column.

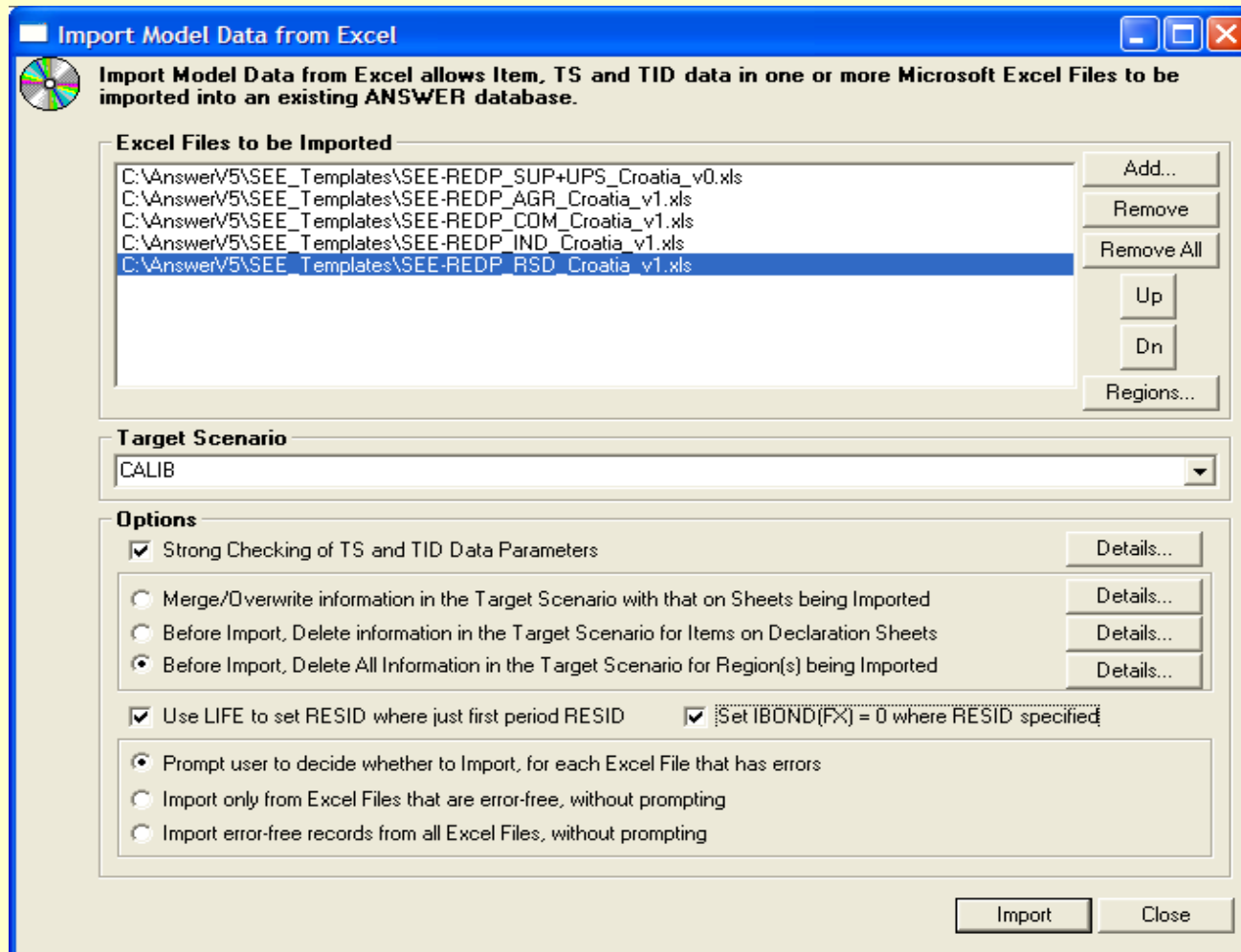
      Check All Commodity Descriptions
      -----
      All of the Descriptions in the CommDesc column obey ANSWER conventions.

      Check All Commodity Units
      -----
      All of the Units in the CommUnit column are valid.

      Check All Commodity Set Memberships
      -----
      All of the Set Memberships in the Set Memberships column are valid.

      For Help, press F1
      
```


Template Use – Loading Templates into ANSWER



Minor Improvements

- ◆ Reporting electricity/heat generation by timeslices and calculate the expenditure on fuel by technology
 - ❑ \$SET T04TD “YES” for generation by TD(Z)(Y)
 - ❑ \$SET T08TD “YES” for consumption by TD(Z)(Y)
 - ❑ \$SET T25FE “YES” for fuel expenditure
- ◆ The emissions variable (R_EM) may now be included in user constraints
 - ❑ Parameter RAT_EM