The VERSatile Data Analyst (VEDA)

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VEDA-FE Orientation

- VEDA-FE Features
- VEDA-Navigator and System Organization/Components
- User Templates
- Basic Operations
- Advanced Features
- Other Capabilities & Options
VEDA-FE Features

- Knowledge in Sanskrit (oldest scriptures of Hinduism and most ancient religious texts in an Indo-European language)
- Highly modular design
- Heavily reliance on flexible Excel Spreadsheets integrated with a core database
- Direct linkage to existing data source (e.g., IEA energy balance statistics, USEPA eGRID, EuroStat)

VEDA-FE Features (Cont.)

- Calibration templates for Base year
- Sub-RES repository for central organization and consistent depiction of future technologies
- Flexible management of (sophisticated) Scenarios files
  - "Rule-based" data additions and updates
  - VEDA assisted template construction
- Functionality designed specifically to handle multi-region modeling needs, including
  - Technology repository "inheritance" XLS matrix with regional adjustment factors
  - Trade matrix specification, with data supported via assisted Scenario Files
- Demand projection module tied to economic indicators, fine-tuned with analyst insight
- User-defined constraint definition and creation "assistant"
VEDA-FE Features (Cont.)

- RES diagramming with data views (and results via VEDA-BE)
- Powerful filter and search facilities
- Supports both MARKAL and TIMES models
- Complimented by VEDA-BE for analysis of model run results via GAMS GDX2VEDA linkage, and input data via “VD dump”

VEDA System Integration
VEDA Folder Organization

VEDA Folder Organization

VEDA - FE User Workbooks

- Base-Year Templates:
  - Starting stock of technologies by region and sector
- QData:
  - Default parameters for B-Y techs [rule-based]
- ZysSettings:
  - Default interpolation rules and parameter values, as well as Commodity Group definition [rule-based]
- SubRES Data/Transformation files:
  - New technology definitions data specification and transformation (for the respective SubRES) [rule-based]
**VEDA-FE User Workbooks (Cont.)**

- Demand files:
  - Demand drivers, sensitivity series, region-segment-driver allocation table
- Scenario files:
  - Data specification and transformation for the entire RES [rule-based]
- Trade Scenarios:
  - Parameter specification for the trade technologies; this is the only way to create parameters for the IRE processes [rule-based]
- UC Scenarios:
  - The special share constraints: big set based on output and the subset based on input [rule-based]

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**VEDA-Navigator Template Management**
1. Select a different model
2. See the files listed in windows explorer (every frame title works this way)
3. Select the active QData file
4. Open the QData file in Excel
5. Import a scenario file. ZysSettings is imported at the end of any import operation automatically.
6. Create a new scenario file (VEDA-assisted)
7. Delete existing scenarios
8. Import selected SubRES files. This step needs to be followed up with the main import operation.

9. Switch between listing SubRES and transformation files.
10. Delete a SubRES
11. Browse the SubRES
12. Import a file with demand drivers, series and DM-driver-series allocation
13. Create a new Demand scenario
14. Delete a Demand scenario
15. Import a Trade scenario (parameters only) into the intermediate database.
16. Define trade links of three types: unilateral, bilateral, or market
17. Create a new scenario (VEDA-assisted)
18. Delete scenario
19. Delete all scenarios
20. Transfer all trades information from the intermediate database to the active database.
21. Import a UC scenario into the intermediate database
22. Create a new UC scenario
23. Delete a UC scenario one
24. Delete all UC scenarios
25. Make the UC database consistent with the active database

**DEMO-TIMES Overview RES**

- **Mining + Import**
  - Fossil
  - Renewable

- **Electricity + Heat**

- **Material + Gas**

- **Refinery**

- **Crude Oil**
  - Transport Techs

- **Industrial Techs**
### DEMO-TIMES Electricity/Heat Subsystem

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Steam</td>
<td>COAHAR</td>
<td>ECOASTM00</td>
<td>ELC</td>
</tr>
<tr>
<td></td>
<td>COAHAR</td>
<td>ECOASTM100</td>
<td>ELC</td>
</tr>
<tr>
<td></td>
<td>COAHAR</td>
<td>ECOASTM200</td>
<td>ELC</td>
</tr>
<tr>
<td>Dual Fuel</td>
<td>OILDIST</td>
<td>EGASOIL00</td>
<td>ELC</td>
</tr>
<tr>
<td>Hydro</td>
<td>RENHYD</td>
<td>EHYDJOI00</td>
<td>ELC</td>
</tr>
<tr>
<td>Pumped Storage</td>
<td></td>
<td>SHYDSTG00</td>
<td>ELC</td>
</tr>
<tr>
<td>Dual Fuel CHP</td>
<td>OILDIST</td>
<td>EGOLCHP00</td>
<td>HETH</td>
</tr>
<tr>
<td></td>
<td>OILDIST</td>
<td>EGOLCHPC00</td>
<td>HETH</td>
</tr>
<tr>
<td></td>
<td>OILLPG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat Plant</td>
<td>COAHAR</td>
<td>HPLTCA000</td>
<td>HETH</td>
</tr>
</tbody>
</table>

### BY Template Organization – TCH

![BY Template Organization – TCH](image-url)
Template Workbook Controls

- FI <nature> - flexible input indicator
  - List of predefined <nature> options, key ones include: T/Comm (tech/commodity table), Region, ST (tech sets), CT (tech characteristics)

- <keyword> - component specification indicator
  - List of predefined <keyword> options, examples include: TFM_<type> (UPD/INS/FILL), include/exclude_<tech/comm> (grouping criteria), ADRATIO_<qual> (UC components), DRVR_<type> (demand series), COMEMI/AGG

- / - I/D for ignore or data override for this row
  - Same predefined <nature> options as for ~FI (for the most part)

- Data is processed from the cell to the right and/or the next row down until a blank column/row is encountered, and hold until the next indicator

- List of values may be provided separated by ‘,’
- When qualifier required -<qual_value> is appended to the parameter name (e.g., period, emission, type)

[No quality control on ~keywords or parameter names]

VEDA/TIMES Parameters

...
**SubRES Data Templates**

Technology qualifiers identify candidates based upon set members and/or masks for topology (commodity in/out) and/or name/description masks.

Commodity qualifiers identify candidates based upon set membership and/or name/description masks.

**VEDA Template Qualification Rules**

- Subsets of technologies may be identified via Include/Exclude rules in various types of VEDA templates (e.g., SubRES, Scenario, UCs).
  - Technology qualifiers identify candidates based upon set members and/or masks for topology (commodity in/out) and/or name/description masks.
  - Commodity qualifiers identify candidates based upon set membership and/or name/description masks.
Scenario QData Templates

Scenario ZsysSettings Templates
Scenario Trade Templates

Scenario UC Share Template Prep
Scenario UC Share Templates

VEDA-FE Basic Functions

- New Database - Import (Templates)
- Browse/Edit
- Reference Energy System network diagrams
- Solve
VEDA-Navigator New Database (Cont.)

VEDA Error Logs (Examples to be provided)
VEDA-FE Browse/Edit

- It is primarily for viewing data (as changes are NOT reflected in the application templates)
- What you see is
  - Multi-select lists for Scenarios, Regions, Processes, Commodities, Parameters, Other; subject to any subset imposed
  - A dynamic cube of the selected data
  - Various view, edit and export options
- Graphing model assumptions

VEDA-FE Browse/Edit: Select & Search
VEDA-FE Search Engine

- No wildcards needed (string match based upon start/any/exact)
- Concatenated criteria by ‘,’
- Short name and/or description (with and/or control between them)
- Include/excluded based upon above
- Incremental (add to existing selection list, or 1st clear current selections)

VEDA-FE Browse/Edit: Layout & Actions
VEDA-FE Browse/Edit: Graph

VEDA-FE RES Network and Data View
VEDA-FE Running a Model

- Select/Order Scenarios, pick Regions, indicate final Period for the run
- Provide a Case Name
- Specify the Model Variant and Options
- Identify Source and Work folders (first time)
- Set Solver Options file (first time)
- Adjust GAMS control templates (if desired)
- Solve the model (initiating a GAMS job in a Command Window)
- View log/list files
- Clean out work folders

VEDA-FE Solve to Submit a Model Run
VEDA-FE Solve Template Files

VEDA-FE Solve Log & List Files
VEDA-FE Demand Manager

Driver/Shaping Selection
VEDA-FE Demand Manager – Drivers

VEDA-FE Demand Manager – Projection
VEDA-FE Trade Module

VEDA-FE User Constraints (Don’t Use (for now) – Discussed later)
VEDA-FE Process/Commodity/CG Master Viewing

VEDA-FE SubRES (TechRep)
VEDA-FE Error Logs - System

VIDE-FE - If Problems Arise

- Send the ..\Logs folder files to the system administrator
- Via Navigator
  - Recreate the Active database
  - Recreate VFE_Work
- Rebuild basebase (pending)
VEDA-BE Description

- Manages (GAMS) Sets, Parameters and Model Results for the purpose of dynamic viewing and re-organizing, and presentation to others
- Allows for cross-cutting access to parameters and results according to index structure and element values
- Supports construction of user-defined sets, definition of new tables, and manipulation of tables
- Provides powerful filtering capabilities on both elements names and descriptions

VEDA-BE Description (Cont.)

- Employs customizable n-dimensional Data Cube component for displaying tables
- Batch REPORT mode
- Full-blown graphing facilities, as well as exporting to Excel, Word, PPT, HTML
- Web-enabled, allowing model results to be made available over the web in user-friendly, reconfigurable tables
- Convenient GDX2VEDA data definition file for identification of information to be ported from GAMS to VEDA, or other data sources (e.g., eGRID)
VEDA-BE New Database - Steps

1. **New Database**
   - Enter Database Name
2. **Security Warning**
   - Opening C:\VEDA-BE\DATA4A\I1TEST\results.MDB
   - This file may not be safe if it contains code that was intended to harm your computer.
   - Do you want to open this file or cancel the operation?
   - Options: Cancel, Open, More Info
3. **Tasks**
   - Tasks: Miscellaneous, Miscellaneous, Miscellaneous, Miscellaneous
   - Details: Miscellaneous, Miscellaneous, Miscellaneous, Miscellaneous
   - Errors: Miscellaneous, Miscellaneous, Miscellaneous, Miscellaneous

VEDA-BE Import Results

1. **Import Files**
   - Import Files Locations
   - C:\
   - Include Subdirectories
   - Add Path, Del Path, Continue

2. **Manage Import Files Locations**
   - Options: OK, Cancel
VEDA-BE Cube - Appearance

VEDA-BE Cube – Value Filter
VEDA-BE Cube – Analysis Graph

VEDA-BE Cubes - Multiple & Data Filter
VEDA-BE RES w/ Results

VEDA-BE User Sets - Definition
VEDA-BE User Sets - Delete

VEDA-BE Table – Aggregation Rules
VEDA-BE Table - Organization

VEDA-BE Batch Mode – Table List
VEDA-BE Tools - Options

VEDA-BE Tools - Units
VEDA-Viewer WWW – Application Form

VEDA-Viewer – XLS Export
**GAMS/VEDA-BE Linkage – <Appl>.VDD File**

**VEDA-BE Flavors**

<table>
<thead>
<tr>
<th>Name</th>
<th>Characteristics/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewer</td>
<td>Views only cube files provided from VEDA-Complete/Developer or KanORS.</td>
</tr>
<tr>
<td></td>
<td>No save of restructured cubes, no new tables, no export.</td>
</tr>
<tr>
<td></td>
<td>This will be similar to the www demo, but easily installable locally.</td>
</tr>
<tr>
<td>Lite</td>
<td>A dedicated loaded VD application.</td>
</tr>
<tr>
<td></td>
<td>No import facility.</td>
</tr>
<tr>
<td></td>
<td>MDB provided by VEDA-Complete/Developer or KanORS.</td>
</tr>
<tr>
<td></td>
<td>Full features to create new tables, unit conversion, export etc.</td>
</tr>
<tr>
<td></td>
<td>Can be used w/ multiple applications.</td>
</tr>
<tr>
<td>Standard</td>
<td>Only supports an existing structure (thus no new database option).</td>
</tr>
<tr>
<td></td>
<td>Distributed with initial MDB provided by Complete/Developer or KanORS.</td>
</tr>
<tr>
<td></td>
<td>Can import new sets of results.</td>
</tr>
<tr>
<td></td>
<td>Full features to create new tables, unit conversion, export etc.</td>
</tr>
<tr>
<td>Complete</td>
<td>Can construct new databases based on the VD file headers.</td>
</tr>
<tr>
<td>XLS Add-in</td>
<td>XLA add-in to write VD files</td>
</tr>
<tr>
<td>Developer</td>
<td>Can create the input for VEDA-Viewer, both for the local and www variety, as well as Lite/Standard users of their applications (though users need to purchase VEDA-Lite/Standard).</td>
</tr>
</tbody>
</table>