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, Euro Stat)

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 multiregional 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-Navigator Template Management
**Veda-FE User workbooks**

- **Base-Year Templates:**
  - Starting stock of technologies by region and sector
- **QData:**
  - Default parameters for B-Y techs [rule-based]
- **SysSettings:**
  - 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]

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**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]
**VEDA-Navigator Operation**

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. Create a new scenario file (VEDA-assisted)
6. Select All scenario file
7. Switch between listing SubRES and transformation files

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**VEDA-Navigator Operation**

8. Select all SubRES
9. Browse the SubRES
10. Create a new Demand scenario
11. Select all Demand scenario
12. Define trade links of three types: unilateral, bilateral or market
13. Create a new scenario (VEDA-assisted)
14. Select all scenarios
15. Create a new UC scenario
VEDA-Navigator Operation

16. Select all UC scenarios
17. Show the Consistent status of VFE-Work and recreate Database on click.
18. Show the Consistent status of Active DB and recreate Database on click.
19. Synchronize all Data Components

Veda-Navigator Template Management

[Diagram showing the connections between Mining + Import, Fossil, Renewable, Electricity + Heat, Material + Gas, Gas, Industrial Techs, Transport & Other Demand Techs, Refinery, Crude Oil]
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**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Simulation Technology</th>
<th>Commercialization</th>
<th>Analysis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT DEG</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Description</td>
</tr>
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</table>

**BY Template Organization – UC**
SubRES Data Templates

- 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.

VEDA Template Qualification Rules
### Scenario QData Templates

![Excel spreadsheet](image1.png)

### Scenario SysSettings Templates

![Excel spreadsheet](image2.png)
Scenario Trade Templates

Scenario UC Share Template Prep
Scenario UC Share Templates

- VEDA-FE Basic Functions
  - Browse/Edit
  - Reference Energy System network diagrams
  - Solve
VEDA-Navigator New Database

VEDA-Navigator New Database (Cont.)
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 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 Browser: Dynamic Data Cube

VEDA-FE Browser: Select & Search
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 Case Manager
VEDA-FE Solve LST Files

VEDA-FE Advanced Functions
{Demands, and UC Master also available via Navigator}
VEDA-FE Demand Manager – Driver/Shaping Selection

VEDA-FE Demand Manager – Drivers
VEDA-FE Demand Manager – Projection Adjustment

VEDA-FE Trade Module
VEDA-FE Process/Commodity/CG
Master Viewing

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

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 reorganizing, 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

VEDA-BE Import Results
VEDA-BE Table - Specification & Search

VEDA-BE Dynamic Cube – Layout & Options
VEDA-BE User Sets - Definition

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 - Delete

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

![Diagram of VEDA-BE Table - Organization](image1)

**VEDA-BE Batch Mode – Table List**

![Diagram of VEDA-BE Batch Mode – Table List](image2)
VEDA-Viewer WWW – Application Form

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

<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. No save of restructured cubes, no new tables, no export. This will be similar to the www demo, but easily installable locally.</td>
</tr>
<tr>
<td>Lite</td>
<td>A dedicated loaded VD application. No import facility. MDB provided by VEDA-Complete/Developer or KanORS. Can be used w/ multiple applications.</td>
</tr>
<tr>
<td>Standard</td>
<td>Only supports an existing structure (thus no new database option). Distributed with initial MDB provided by Complete/Developer or KanORS. Can import new sets of results. 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. 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>