Energy Engineering Economic Environment
Systems Modeling and Analysis S.r.l.



ETechDS Data Normalization and Handling for Modelling Use Phase I

Making the data usable with a TIMES demo model

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Glossary

ETechDS	ETSAP Energy Technology Data Source
ETSAP	Energy Technology Systems Analysis Program
IEA	International Energy Agency
PV	(Solar) Photovoltaic
TIMES	The Integrated Markal-Efom System
Veda-FE	Veda Front-End software (by Kanors)

1. Introduction

This report is part of the service provided by E4SMA S.r.l. for the Centre for Renewable Energy Sources (C.R.E.S.), acting as the Operating Agent of the IEA Energy Technology Systems Analysis Programme (IEA-ETSAP), within the project titled «ETechDS Data Normalization and Handling for Modelling Use, Phase I - Making the data usable with a TIMES demo model».

The key objective of the present study is to include the direct link between an Excel spreadsheets database, provided by IEA-ETSAP, and the TIMES models under Veda Front-End (Veda-FE) *SubRes*.
This task has involved the creation of a Veda-FE *SubRes* input file which elaborates and transfers the techno-economic information contained in sectoral specific energy technology databases of the ETechsDS (ETSAP Energy Technology Data Source) into a model-oriented characterisation. The structure has been built in such a way that:

- Future updates in the existing values of the ETechsDS databases are directly reflected to the model *SubRes*.
- Additional technologies may be easily added with little additional work.
- Naming conventions and key input parameters are specified accordingly to the structure and definition of the TIMES-Demo model; however it can be controlled to adapt easily to the characteristics of any other model.

The next section provides a simple users' guide. It should be noted that it is assumed that the reader has a basic understanding on the operation of VEDA-TIMES tool. This document is not intended to be a tutorial on the use of the software.

2. Veda-FE user guide

The Veda-FE *SubRes* repository has been developed aiming to translate the techno-economic information contained in the ETechDS spreadsheets database technology into a VEDA-TIMES modelling language.
The database – as provided by IEA-ETSAP – contains both sets of technologies from the supply and transformation side – i.e. from the power sector – and demand side – i.e. from industry, buildings and transportation. As the ETechDS covers only a limited set of technologies for each of the sectors, the *SubRes* should not be seen as a complete technology repository to be readily used in a model, but might be used as a useful basis on how to approach to certain technology options in different sectors. As more information will be provided in future ETechDS excel databases, the *SubRes* might be easily expanded in future phases to a complete ready-to-use technology repository.

The Veda-FE *SubRes* uses as input the information contained in the following ETechDS sectoral datasheets:

- Power sector: *POWER 31JAN15 OKP.xlsm*, which includes information about 3 gas-fueled power plants, 1 nuclear plants and 2 photovoltaic (PV) plants.

- Industry: *INDUSTRY 31AN15 OKP.xlsm*, which includes information about one dummy industrial process.
- Buildings: *BUILDINGS 31AN15 OKP.xlsm*, which includes information about one dummy electric appliance.
- Transport: *TRANSPORT 31JAN OKP.xlsm*, which includes information about one advanced gasoline car.

The current ETechDS structure also includes few additional technologies – namely two nuclear plants, one PV plant, two industry processes, two buildings technologies and four vehicles – but techno-economic information are currently missing. These are included in the *SubRes*; but to ensure the correct model functioning are deactivated. Whether new information will be added in the source files a routine will automatically update these values and enable these processes.

The following is a step by step guide on how data is transferred from ETechDS excel databases to the Veda-FE *SubRes* repository. This guide is based on the Excel workbook *SubRes_E-TechsDS.xlsx* and describes each worksheet with the workbook.
The Veda-FE *SubRes* arranges the key input information; data elaborations and the VEDA-TIMES input tables as follows:

- **ETechDS worksheets:** contain the raw information from the ETechDS datasheets, directly linked to the source files. This ensures that any future update on source file will be automatically transferred to the SubRes datasheet simply updating linkages between files.
- **Input worksheet:** it includes all the additional modelling input information not contained into the ETechDS datasets, e.g. model base year definition, sector/process/commodity naming conventions, model units, etc.
- **Veda-FE input worksheets:** contain all VEDA-TIMES input tables, converting and organizing (by sector) the information.

The flow diagram of Figure 1 shows how each sheet of the database interacts with the next.

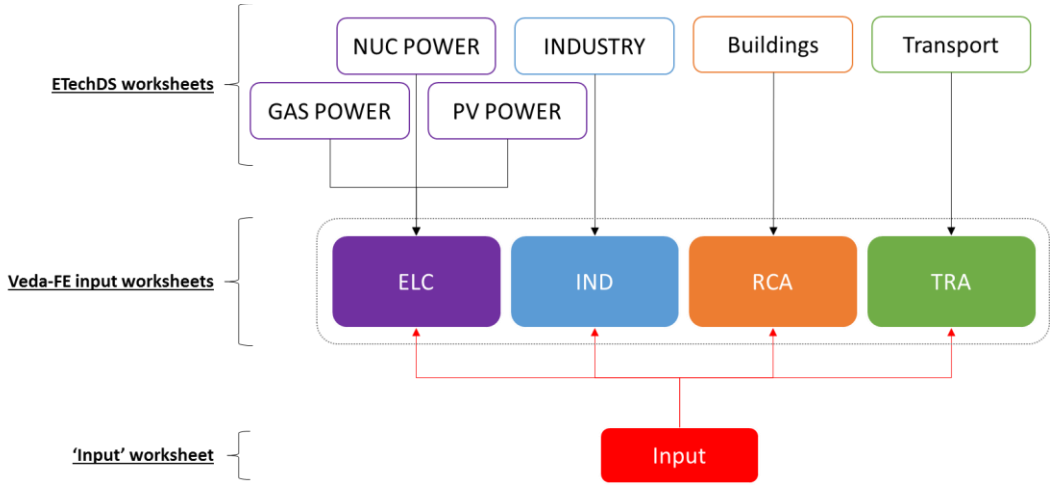


Figure 1. Workflow of Excel SubRes technology database

2.1 ETechDS worksheets

ETechDS worksheets are the following:

- 'GAS POWER'
- 'NUC POWER'
- 'PV POWER'
- 'INDUSTRY'
- 'Buildings'
- 'Transport'

These worksheets allow the direct transfer of information between the ETechDS database and the *SubRes*. They include the complete set of data available in the ETechDS and all values are directly linked (as external source) to the source file. Any update or change in the source values will be transferred simply updating the linked values[1]. No additional conversions or calculations are made in these sheets.

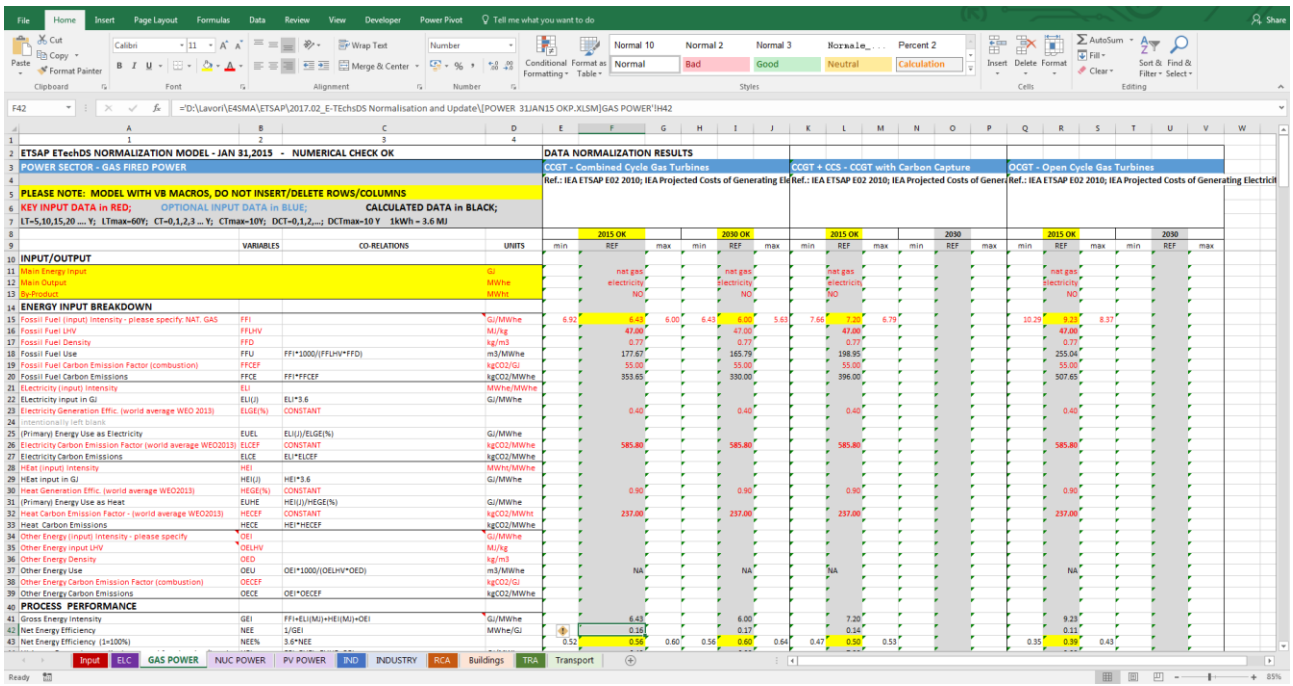


Figure 2. Screenshot of one of the ETechsDS worksheets

2.2 'Input' worksheet

The worksheet includes the modelling information which are missing in the ETechDS technology database and are specific of the model to be used with.
These includes:

- General model setup, e.g. model base year, type of currency used.
- Naming conventions for sectors, fuels and commodities.

[1] Using the Excel 'Edit links' feature.

- Model-specific units.

For each of these input tables a color code is used to distinguish between required user inputs, and automatically calculated values.

This approach ensures the *SubRes* to be easily adapted to several model structure and naming conventions. The existing conventions used in the delivered *SubRes* are based (when possible) with structures and definitions of the TIMES-Demo model.

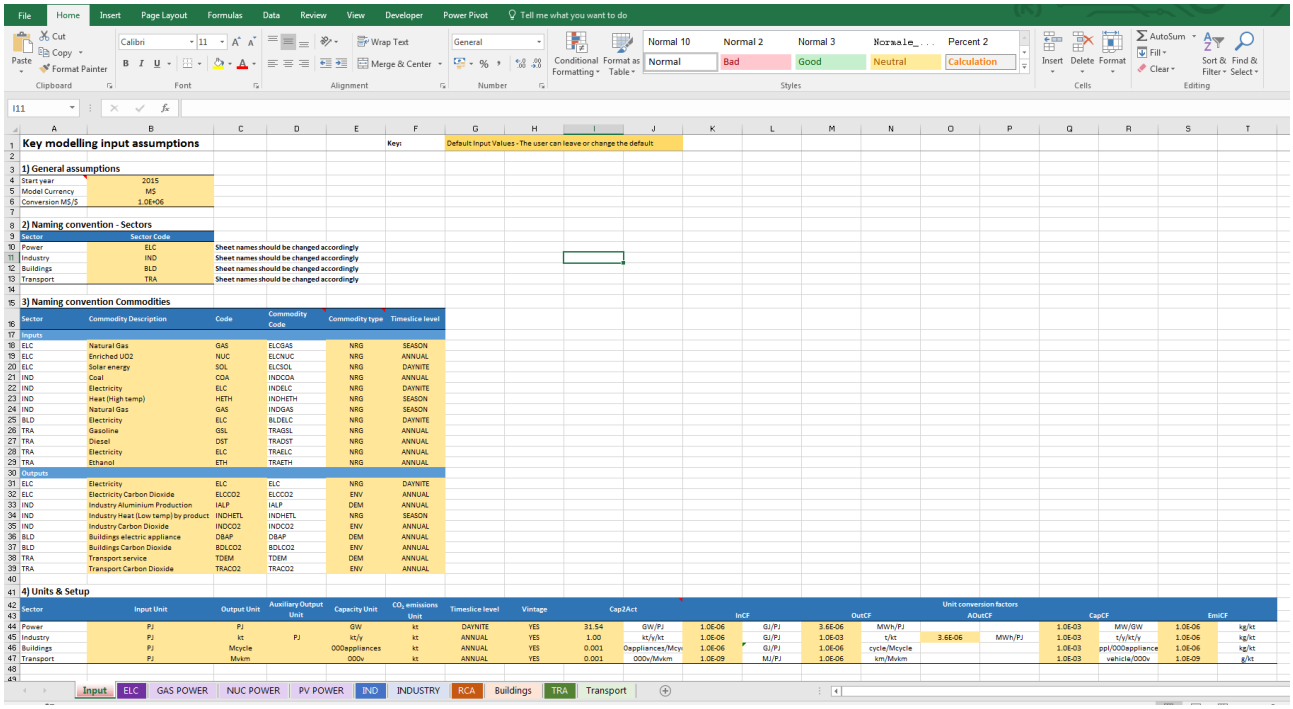


Figure 3. Screenshot of the 'Input' worksheet

2.3 Veda-FE input worksheets

Veda-FE input worksheets are:

- 'ELC'
- 'IND'
- 'RCA'
- 'TRA'

These structured worksheets translate the relevant information both contained in *ETechDS worksheets* and *'Input' worksheet* into VEDA-FE modelling structures. Each sheet contains three type of tables:

- *FI_T* table, which defines the process topology (input and output commodities) and sets all relevant techno-economic variables.
- *FI_Process* table, which defines technologies and their key features.
- *FI_Comm* table, which defines commodities and their key features.

Model details and unit conversion factors from 'Input' are applied directly to the relevant cells, as well as for techno-economic values. In this way users are not required to change inputs on

these sheets, which are automatically modified accordingly to changes in both source worksheets.

Technologies which currently don't have any (or partial) techno-economic characterisation are currently excluded. However Excel routines will enable these new technologies, whether data characterisation is provided in the ETechDS source files.

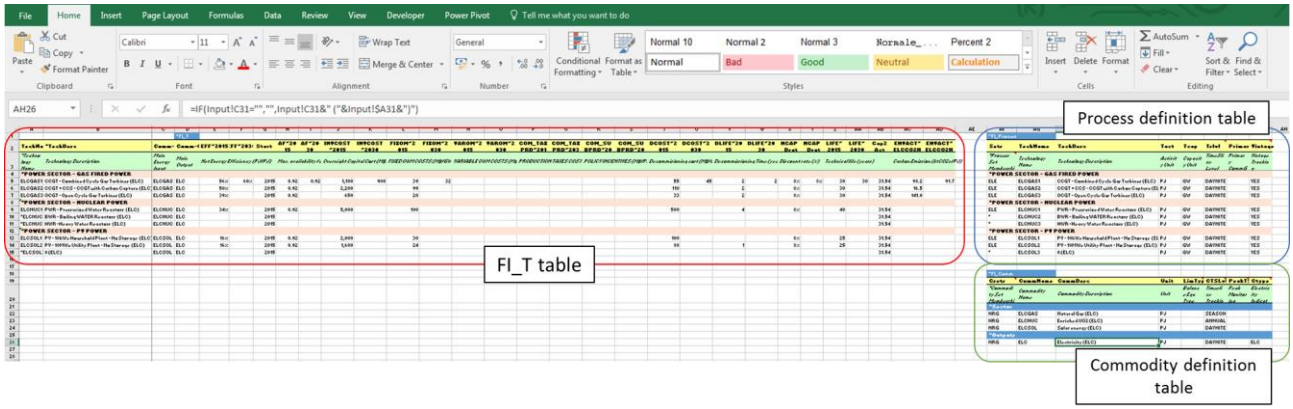


Figure 4. Screenshot of the 'ELC' Veda-FE input worksheet