Exercise: from statistics to energy balances

PART 1: Understanding the energy balance

Please choose and open the file “World Energy Balances - Statisland.pdf”.

The goal of this introductory exercise is to understand the main concepts behind an energy balance and to become familiar with it. The series of questions below will guide you through an analysis of the balance.

Supply

Please refer to the aggregated energy balance for the Statisland in table format.

1. What is the largest energy source in the country’s energy mix?

2. Is the country overall self-sufficient? Why? Is it self sufficient for coal, crude oil and natural gas singularly?

Transformation

3. What is the difference between a negative number and a positive number in the transformation sector?

4. What are the sources of electricity in the country?

5. Focus on “electricity plants”: Where do you find the losses in electricity plants?

6. Focus on “electricity plants”: How much energy is lost in generation from electricity plants? What share of the total input to electricity is it?

Final consumption

7. What is the largest final consumption sector?

8. What is the share of oil products in road consumption?

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PART 2: Building the energy balance

Please open the file BalanceBuilderExercises2024.xls

The purpose of the IEA Balance Builder is to build a country energy balance following the IEA methodology. This can be done either by filling by hand the **"Data in physical units"** and **"Conversion factors"** worksheets or by uploading data from the IEA data questionnaires.

You are presented with a balance builder prefilled with the energy statistics compiled in the Day 1 exercise session, along with some new data on crude oil.

In 2023, Statisland's national oil company reported:

- *1100 kt of crude oil production*
- *700 kt of crude oil shipped to neighbouring country Dataland*
- *120 kt of crude oil stock draws*
- *515 kt of crude oil sold to refineries*

Follow the instructions below to complete the energy balance. Note that yellow cells indicate errors (as explained in the **"Main Menu"** worksheet).

1. Open the **"Data in physical units"** worksheet. There is an arithmetic error in crude oil exports. Please correct this arithmetic error before proceeding. What is the correct value?

2. Now look at the energy balance in the **"Disaggregated balance"** worksheet. Look at the crude oil supply data. Which flow needs to be corrected? To correct, check your calorific values in the **"Conversion factors"** worksheet. Which calorific value should be corrected, and what is the new value? (assume unit error)

3. Return to the energy balance in the **"Disaggregated balance"** worksheet. Look at the column "Total of all energy sources". Which flow indicates that there may be an error in the energy balance? (Hint: Look at the transformation sector. Remember that negative values represent inputs, and positive values represent outputs.).

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4. Go to the worksheet **"Refinery"** to validate the refinery data. Make the required correction in "**Conversion factors**". What is the new percentage share of refinery losses in energy terms? (Hint: Average NCV is used to calculate refinery input in energy terms).

5. Now look at the energy balance in the **"Published balance"** worksheet. Looking at hydro we find numbers in production. What does this mean? What is the implied efficiency?

6. You just received some new data from a renewable energy company that operates solar thermal plants in Statisland. In 2023:

   - *Plant 1 generated 10 GWh of solar thermal electricity that was sold to the grid.*
   - *Plant 2 generated 50 TJ of solar thermal heat that was sold to industries.*

   Fill this data in the **"Data in physical units"** worksheet. What is the value for solar thermal production? (1 GWh = 3.6 TJ) (Hint: Use IEA methodology and implied efficiencies)

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