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# INTEGRATED ENERGY AND CLIMATE ANALYSES PHASE II

Online Regional Workshop on Energy Modelling:
Results of Phase I and Plans for Phase II
11 June 2025

# Country modeling units: what was done and summary of the final reports

Rocco De Miglio
Workstream Lead on Energy Modelling, SECCA

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# AGENDA

| Time (Astana) | Theme | Name and position |
| --- | --- | --- |
| 11:00-11:10 | Welcome notes | Robert Brudzynski, Programme Manager, Cooperation Section, EUD, Republic of Kazakhstan (TBC)<br>Paata Janelidze, Team Leader/Key Expert in Energy Engineering, SECCA |
| 11:10-11:50 | Country modeling units: what was done and summary of the final reports | Rocco De Miglio, Workstream Lead on Energy Modelling, SECCA |
| 11:50-12:40 | Country modeling units: discussion and ideas for the next steps | Kazakhstan<br>Kyrgyzstan<br>Tajikistan<br>Turkmenistan<br>Uzbekistan |
| 12:40-13:00 | Questions and Answers, Conclusions | |

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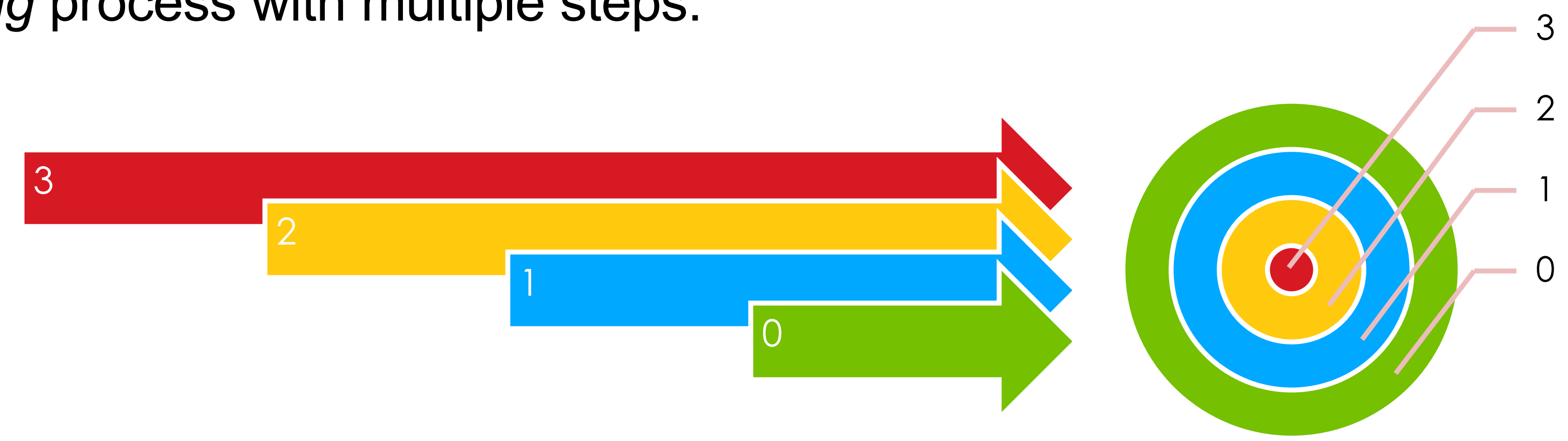
# Modelling in energy&climate policy development

A simplified *ascending* process with multiple steps:




0: organise a proper data collection and analysis (at sectoral level)

0 → 1: move towards a system-oriented approach and a more explicit representation of the key factors involved

1 → 2: design scenarios to explore different combinations of factors (eg goals, policies, uncertainties)

2 → 3: integration of non-energy sectors/components to consider multiple dimensions of the sustainability of the strategies.

# Practical tools and applicable knowledge

| | |
|---|---|
| Training session 1 | **Sankey diagram generators**: generator of diagrams where the width of the arrows is proportional to the flow quantity. It visually represents how energy enters a system (like fuels, electricity), how it is transformed, and where it is used (sector, sub-sector) or lost (e.g., as useful energy, heat losses, etc.).<br>It was presented and used for both familiarising with the existing (balance-based) energy system as well as for designing hypothetical future evolutions (different mix and quantities) and storylines. |
| Training session 1 | **Techno-economic repository**: a collection of information that brings together technical and economic data about different energy technologies.<br>It was presented and used to discuss typical "critical" inputs for complex quantitative analyses of the energy and climate systems. |
| Training session 1 | A "structured" **data collection template** was prepared and distributed to the participants as part of Assignment 1.<br>It can serve as a framework for similar future exercises. |
| Training session 2 | **LCOE calculator**: a tool used to estimate the average cost per unit of electricity (typically $/MWh or ¢/kWh) over the lifetime of an energy-generating asset.<br>It was used to describe and explain one of the key metrics employed to "rank" competing energy technologies, and to present all the underlying technical, economic and financial assumptions and the sensitivities to their variations. |
| Training session 2 | **ReZoning**: an open and interactive, web-based platform designed to identify, visualize, and rank zones that are most suitable for the development of solar, wind projects at country and sub-country level.<br>It was presented and used to estimate solar and wind "potentials" and learn about the key trade-off (economic, spatial, planning, aesthetic, etc,) and to calculate the corresponding LCOE. |
| Training session 2 | A "structured" **policies&measures collection template** was prepared and distributed to the participants as part of Assignment 2.<br>It can serve as a framework for similar future exercises. |
| Training session 3 | **Energy demand projection calculator**: a spreadsheet-based tool used to explore how much energy/electricity will be needed in the future, based on different variables such as population and economic growths, efficiency improvements, etc.<br>It was presented and used as a test—bed to design simple scenarios, and explore the possible space of "decoupling" between energy needs and energy service growths. |
| Training session 3 | **Demand fractions calculator**: a tool to help to break down how energy service demands vary throughout typical time slots (eg within days and seasons in a year).<br>It was presented and used to introduce behavioural-like type of elements in the analysis, and to help defining peak/off-peak needs and priorities for policy interventions. |

# Assignment 3 - Next steps

**Purpose of the final assignment**

- To demonstrate the young professional’s new knowledge and skills (understanding of the training sessions).
- To apply “theoretical” knowledge to practical problems (country-specific).
- To analyse, interpret, or evaluate information critically.
- To present well-reasoned / structures arguments or proposals (deliverable).


*Context, problems statement and key issues to investigate, proposed instruments and goals, methodology and data requirements / gaps, role of stakeholders involved, areas for future research or action, etc.*

[FINAL submissions]

- To provide proposals and ideas for **future** developments of country analyses and tools (next phase)

# Phase I – Phase II

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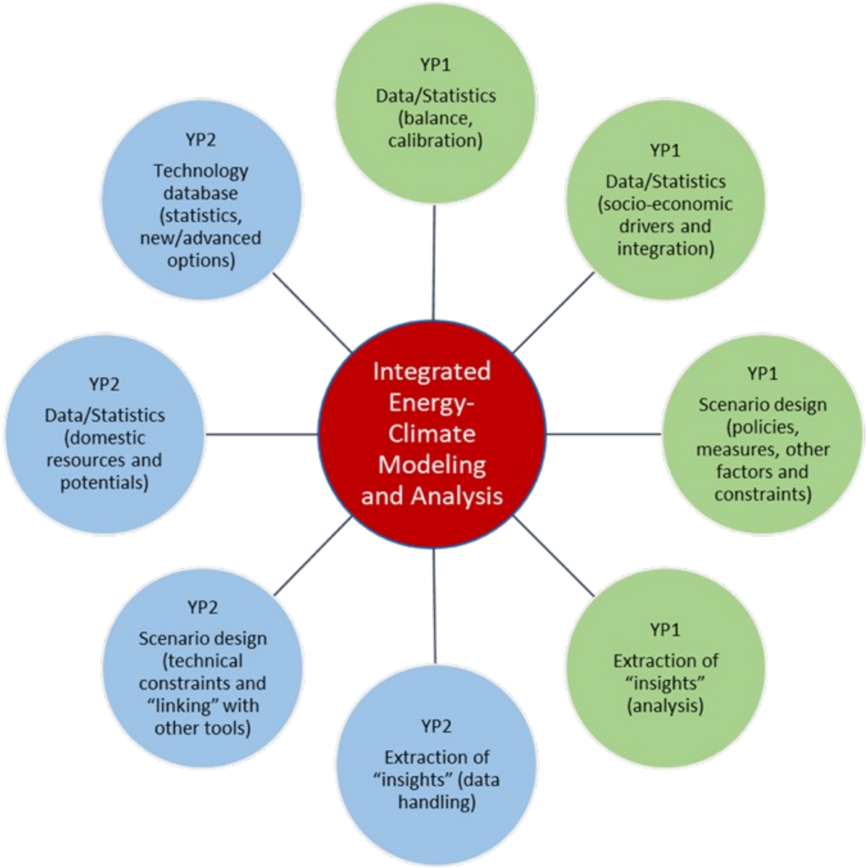


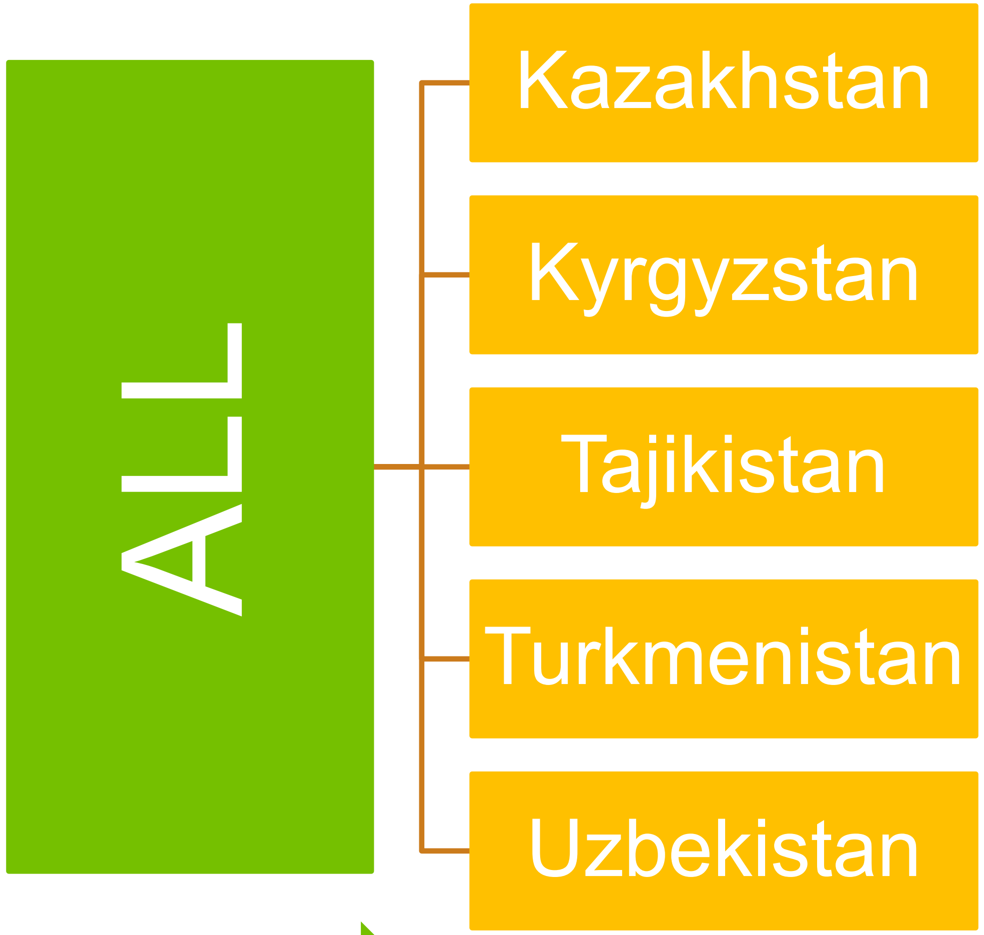


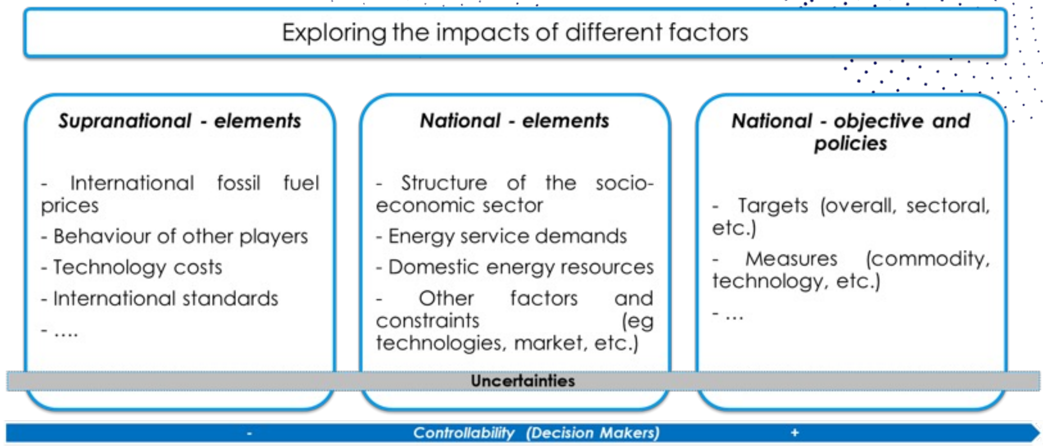


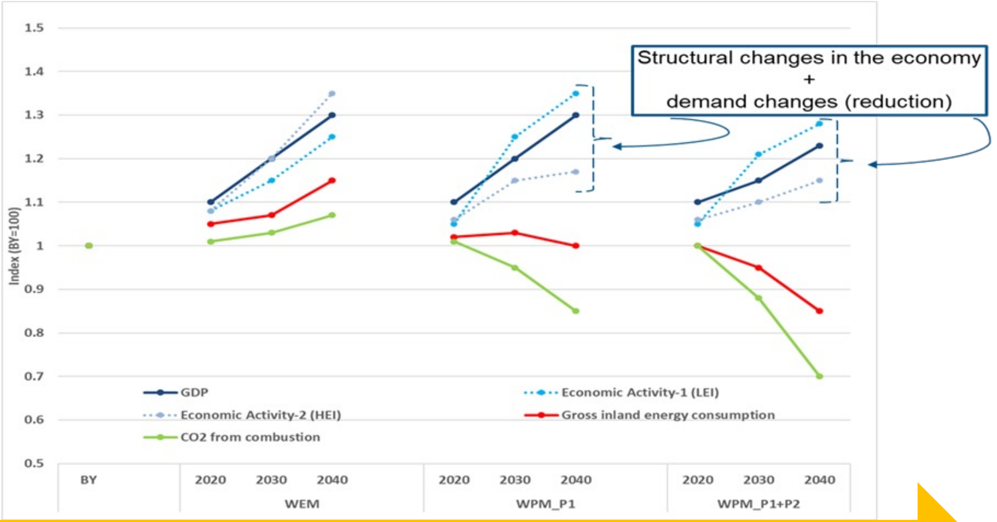


Phase I - Theory

Phase II - Application

While the first part focused on building a common understanding—covering harmonised terminology, key technical&methodological details, connectivity among country experts, and trainings—the second part will adopt a more targeted, country-specific and application-oriented approach.

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# Phase II - Approach

**The primary goal is to *strengthen local system-thinking and data-driven decision-making in the energy and climate sectors.***

Our approach focuses on applying and stress-testing acquired knowledge in real-case scenarios, followed by critical reflection and commentary.
We are not aiming to solve complex national-level challenges that require extensive expert analysis and resources. Instead, we aim to create opportunities for meaningful reflection using the tools and methods at our disposal.

**When designing the case study (scenario-based), it is important to maintain realistic expectations and focus on maximizing the benefits of the exercise, while remaining mindful of its limitations.**

Design of the case study

1. Evaluation of the Assignment III (today)
2. Discussion (today)
3. Further elaborations (based on today's talk)
4. Regional workshop in July
5. Finalisation of the design and work

- Clarity of the problem statement
- Understanding and integration of the tools
- Soundness of the proposed methodology for next steps

# Assignment III and Phase II - Kazakhstan

Kazakhstan's coal dependency presents both a significant challenge and a major opportunity in the context of its national decarbonization goals.

Through this assignment, we explored three key strategies:

- carbon pricing,
- coal-to-gas transition,
- and strengthening the emissions trading system

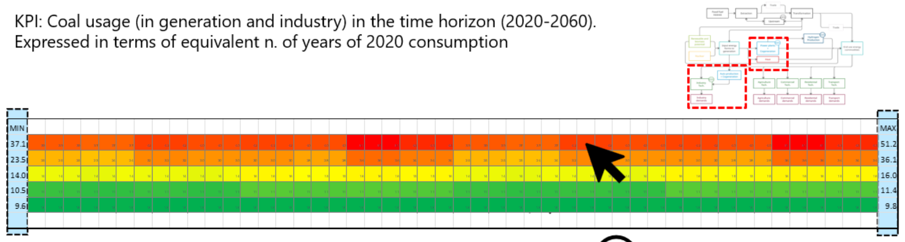
all of which have the potential to drive meaningful emissions reductions if properly implemented and supported by data.

The next steps should focus on filling key data gaps, particularly by gathering as much detailed information as possible about the current functioning of Kazakhstan's ETS. At the same time, by integrating practical insights from international experience, we aim to develop and propose a strengthened, country-specific ETS model that is more effective, and aligned with Kazakhstan's long-term climate commitments.

*From Coals to Goals: Challenges towards carbon neutrality in Kazakhstan*

https://secca.eu/secca-presented-energy-scenarios-for-kazakhstan/

KPI: Coal usage (in generation and industry) in the time horizon (2020-2060).
Expressed in terms of equivalent n. of years of 2020 consumption




Dark red cells: high number of years
Orange/Yellow cells: intermediate
Dark green cells: low number of years

A tooltip displays the description of the case when users point the corresponding cell.

*Two click away* from case specific results:
- Generation capacity
- Electricity generation
- Total emissions
- Final consumption

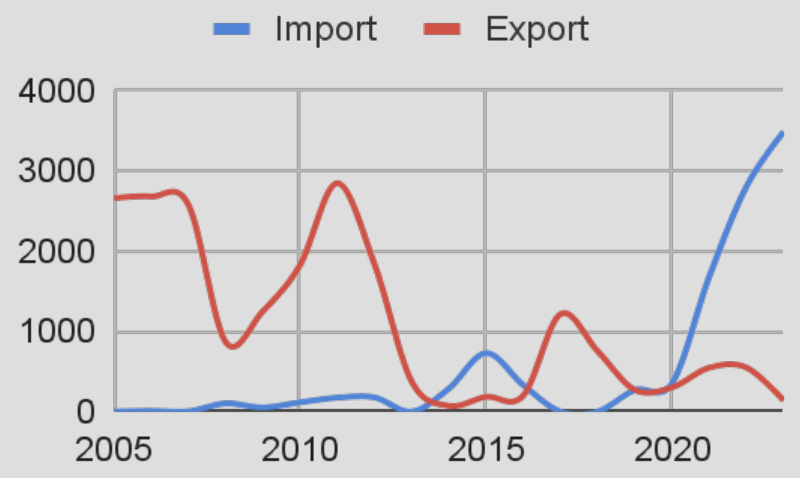
**The idea is well formulated, and I fully support its further development and application.**

# Assignment III and Phase II - Kyrgyzstan

Based on this analysis, the central problem explored in this report is as follows:

- *How can Kyrgyzstan begin to address its seasonal electricity supply-demand imbalance by strategically leveraging solar and wind potential, while managing affordability concerns under the evolving electricity tariff regime?*

Diagram 1. Kyrgyzstan's electricity imports and exports, million kWh




The team has begun identifying the rationale/tools required for the task (among those presented during the training).

- Electricity Demand Projection and Seasonal Deficit Estimation
- Least-Cost Renewable Energy Expansion Planning
- Affordability and Tariff Stress Testing
- Scenario Analysis of Subsidy and Pricing Models

- Efficiency Improvements (technology substitution)

**The idea is solid and the concept is clear but it still needs some small refinement, yet I am fully in favor of its implementation.**

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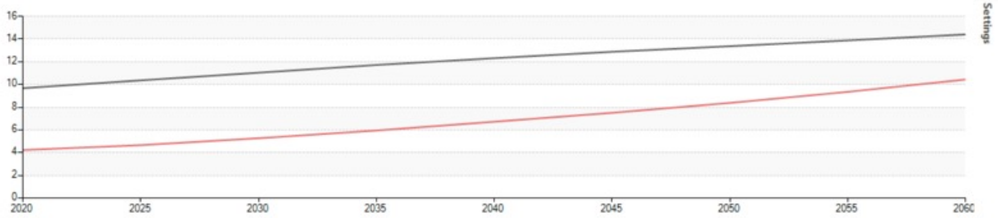
# Assignment III and Phase II - Tajikistan

- *What are the current power supply situation, future demand and deficit in Tajikistan?*
- *How to decrease power deficit, supply all sectors of national economy with reliable and sustainable energy?*

To supplying all consumers with reliable and sustainable energy should be identify a number of potential measures and recommendations for the successful implementation of energy policies, by:

- analysis of power supply situation in Tajikistan;
- energy consumptions projects for next 6-7 year period (2025-2030);
- identifying power deficit potential for the next 7-years period;
- evaluating potential energy sources for reducing power shortage/deficit;
- impact and benefit analysis of supplying all consumers and economy with reliable and sustainable energy.

Simple demand projections calculator (.xls)




Timeslices - Fractions (.xls)

| | Basic settings | 0.25 | 0.25 | 0.25 | 0.25 | | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Demand/Timeslice | R | S | F | W | | N | L | M | D | A | E | |
| 1 | Residential-Water heating | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.083 | 0.250 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 2 | Residential-Space cooling | 0.25 | 0.50 | 0.25 | 0 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 3 | Residential-Space heating | 0.29 | 0.00 | 0.29 | 0.42 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 4 | Residential-Lighiting | 0.25 | 0.17 | 0.25 | 0.33 | 1.00 | 0.083 | 0.250 | 0.167 | 0.083 | 0.167 | 0.250 | 1.00 |
| 5 | Residential-Appliances | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 6 | Residential-Cooking | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 7 | Residential-Clothes washing | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.000 | 0.250 | 0.250 | 0.250 | 0.250 | 0.000 | 1.00 |
| 8 | Residential-Dish washing | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.000 | 0.250 | 0.250 | 0.250 | 0.250 | 0.000 | 1.00 |
| 9 | Residential-Refrigeration | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 10 | Tertiary-Public-Water heating | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.083 | 0.250 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 11 | Tertiary-Public-Space cooling | 0.25 | 0.50 | 0.25 | 0.00 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 12 | Tertiary-Public-Space heating | 0.29 | 0.00 | 0.29 | 0.42 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 13 | Tertiary-Public-Lighting | 0.25 | 0.17 | 0.25 | 0.33 | 1.00 | 0.083 | 0.208 | 0.208 | 0.208 | 0.208 | 0.083 | 1.00 |
| 14 | Tertiary-Public-Appliances | 0.25 | 0.17 | 0.25 | 0.33 | 1.00 | 0.083 | 0.208 | 0.208 | 0.208 | 0.208 | 0.083 | 1.00 |
| 15 | Tertiary-Public-Cooking | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 16 | Tertiary-Public-Refrigeration | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 17 | Tertiary-Service-Water heating | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.083 | 0.250 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 18 | Tertiary-Service-Space cooling | 0.25 | 0.50 | 0.25 | 0.00 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 19 | Tertiary-Service-Space heating | 0.29 | 0.00 | 0.29 | 0.42 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 20 | Tertiary-Service-Lighting | 0.25 | 0.17 | 0.25 | 0.33 | 1.00 | 0.083 | 0.208 | 0.208 | 0.208 | 0.208 | 0.083 | 1.00 |
| 21 | Tertiary-Service-Appliances | 0.25 | 0.17 | 0.25 | 0.33 | 1.00 | 0.083 | 0.208 | 0.208 | 0.208 | 0.208 | 0.083 | 1.00 |
| 22 | Tertiary-Service-Cooking | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.000 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 1.00 |
| 23 | Tertiary-Service-Refrigeration | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 24 | Street Lighting | 0.25 | 0.17 | 0.25 | 0.33 | 1.00 | 0.250 | 0.167 | 0.083 | 0.056 | 0.167 | 0.278 | 1.00 |
| 25 | Industry | 0.25 | 0.19 | 0.25 | 0.31 | 1.00 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 1.00 |
| 26 | Agriculture | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.042 | 0.208 | 0.250 | 0.250 | 0.208 | 0.042 | 1.00 |
| 27 | Transport | 0.25 | 0.25 | 0.25 | 0.25 | 1.00 | 0.083 | 0.208 | 0.208 | 0.208 | 0.208 | 0.083 | 1.00 |

**While all topics are relevant and the issues clearly identified, it is essential to select, interpret, and apply specific metrics and methodological details.**

**I suggest exploring the available tools in greater depth.**

# Assignment III and Phase II - Turkmenistan

Based on the national energy system characteristics and goals, three main areas of analysis have been identified: the exploitation of **renewable energy**, production of **green hydrogen**, and **energy efficiency.**

Examples of the implementation of innovative energy efficiency technologies in street lighting systems in cities of Turkmenistan

| Information about installed lamps in street lighting systems in the city of Dashoguz , Dashoguz velayat | | | |
|---|---|---|---|
| **No.** | **Name** | **LED** | **DNaT** |
| 1. | Nurmuhammet Street Andalip | 0 | 1258 |
| 2. | Shabbat Street | 0 | 3369 |
| 3. | Karl Max Street | 0 | 2635 |
| 4. | Chkalov street | 0 | 987 |
| 5. | S. Turkmenbashi Avenue | 0 | 4875 |
| 6. | Heritage Street | 0 | 1746 |
| 7. | Vokzalnaya street | 0 | 845 |
| 8. | Komarova street | 0 | 963 |
| 9. | Ilyinskaya street | 0 | 1375 |
| 10. | Mayakovskaya street | 0 | 547 |
| 11. | Soviet street | 0 | 2153 |
| **GENERAL:** | | **0** | **20 753** |

During the trainings:

- RES (eg LCOE)
- Green H2 (eg LCOH)
- Technology substitution (eg energy savings)

**While all topics are relevant and somehow interrelated, prioritization is necessary to make them tractable within the scope of a quantitative scenario analysis under Phase II.**

**I suggest exploring the available tools in greater depth.**

# Assignment III and Phase II - Uzbekistan

### 3.1 Objective

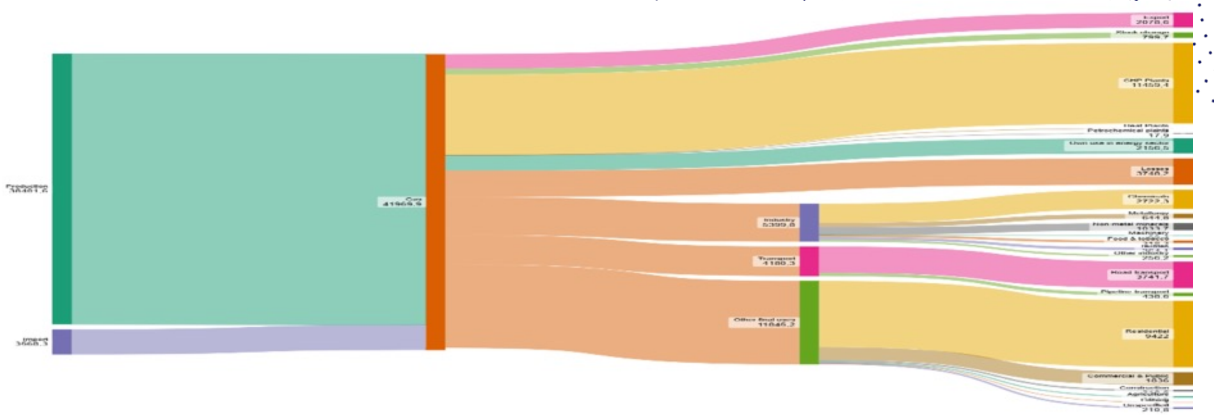
The objective of this chapter is to explore practical ways to reduce Uzbekistan's dependency on natural gas by analyzing current energy use and identifying viable alternatives. The focus is on tools that help assess the structure of gas consumption and evaluate options for increasing the role of renewable energy — particularly in the residential sector.

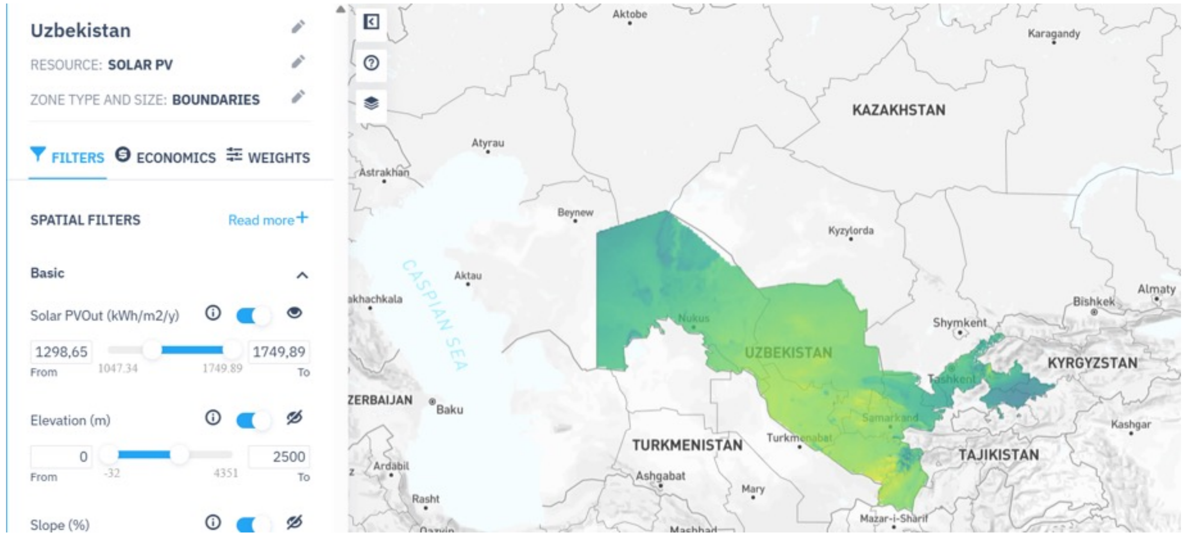
### 3.2 General Approach

The analysis combines two complementary tools to better understand how natural gas is used and where reductions might be possible:

- Visual analysis of energy flows using Sankey diagrams to identify high-consumption segments and evaluate possible shifts in the energy mix.
- Spatial assessment of renewable energy potential using the Global Solar Atlas to identify technically viable areas for solar development as a partial substitute for gas-based energy.

By combining flow visualization with geographic potential mapping, this approach provides a framework for identifying targeted measures to reduce gas dependency — particularly through small-scale solar solutions in the residential sector.






**The idea is solid and the concept is clear but it still needs some small refinement, yet I am fully in favor of its implementation.**

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# Phase II -Regional workshop on elements of country energy planning
# 01–02 July 2025

## DAY 1

| Time | Theme | Name and position |
|---|---|---|
| 10:00-10:15 | Welcome notes | TBC, EUD, Republic of Uzbekistan<br><br>Paata Janelidze, Team Leader/Key Expert in Energy Engineering, SECCA |
| 10:15-10:30 | Quick recap - agenda - goals | Rocco De Miglio, Workstream Lead on Energy Modelling, SECCA |
| 10:30-12:30 | Country modeling units: presentation of Assignment III and ideas for the country explorative exercise – discussion | Young professionals and the representatives of the State partners<br><br>Kazakhstan, Kyrgyzstan |
| 12:30-13:30 | Lunch break | |
| 13:30-16:30 | Country modeling units: presentation of Assignment III and ideas for the country explorative exercise - discussion | Young professionals and the representatives of the State partners<br><br>Tajikistan, Turkmenistan, Uzbekistan |
| 16:30-17:00 | Questions and Answers, Conclusions | |

## DAY 2

| Time | Theme | Name and position |
|---|---|---|
| 10:00-12:30 | Work plan for scenario development and good practices | Rocco De Miglio, Workstream Lead on Energy Modelling, SECCA |
| 12:30-13:30 | Lunch break | |
| 13:30-16:30 | Start of country-level activities | ALL |
| 16:30-17:00 | Questions and Answers, Conclusions | |

No additional physical meetings are planned at this stage, so experts are expected to dedicate their working days entirely to desk-based tasks—both in developing and applying the case study.

Support specific to each country/task will be offered remotely, as required.

Additional material/references can be provided when needed.

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THANK YOU!

Eng. Rocco De Miglio - Energy systems modeller and analyst

# Discussion and Q&A

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