



Brussels, 28 October 2021

Open call for tenders (29 October – 3 December 2021)

Terms of reference: PAC scenario modelling 2.0

These terms of reference are for a two years consultancy for an energy and climate modelling institute to update the Paris Agreement Compatible (PAC) scenario, derive country-specific PAC scenarios, macro-economic key indicators and infrastructure needs. This open call for tenders is published from 28 October until 3 December 2021. We invite potential consultants to provide a quote to CAN Europe based on the following details by 3 December 2021. The initial deadline of 22 November has been extended.

1. About CAN Europe

Climate Action Network (CAN) Europe is Europe's largest coalition working on climate and energy issues. With over 170 member organisations in more than 37 European countries, CAN Europe works to prevent dangerous climate change and promote sustainable climate and energy policy in Europe.

CAN Europe is the European node for CAN International, a worldwide network of more than 700 Non-Governmental Organizations (NGOs) in more than 90 countries, working to promote government and individual action to limit human-induced climate change to ecologically sustainable levels.

2. Contract

Project: PAC project 2.0 ('Informing EU and Member State grid planning and policy making on how to implement a Paris Agreement Compatible scenario for energy infrastructure taking a system approach', grant by the German Federal Ministry for Economic Affairs and Energy)

Type of the contract: CAN Europe directly concludes a contract under Belgian law with the selected consultant. Under the PAC project 2.0, this contract formally is considered a subcontract covering the external support to work packages 2 and 5 assigned to CAN Europe.

Duration of the contract: During the PAC project 2.0, preferred starting date: 1 January 2022, until 31 December 2023



3. Subject of the consultancy

We require a consultant to conduct an in-depth energy and climate modelling for CAN Europe and its NGO member organisations, based on the existing PAC scenario published by CAN Europe and the European Environmental Bureau (EEB) in June 2020.

Starting from an update of the existing PAC scenario data which is mostly aggregated on the EU28 level, the modelling optimises Europe's pathway towards net zero emissions by the year 2040 through the cost-efficient roll-out of a fully renewable energy system. Modelling results allow for deriving fully-fledged country-specific PAC scenarios for the EU27 Member States as well as for selected neighbouring non-EU countries.

Based on the modelling results, macro-economic key indicators are calculated, illustrating costs and benefits of the energy transition on EU27/28 level and on the country-specific level. The modelling also needs to reflect existing infrastructure limitations as well

4. Background

European NGO networks have a track record of suggesting detailed pathways for Europe's energy transition. More than 15 years ago, the series of *energy [r]evolution* scenarios by Greenpeace laid the cornerstone for a science-based vision of how Europe's energy landscape should look like according to civil society. In 2020, more than 150 members and external experts contributed to the Paris Agreement Compatible (PAC) energy scenario by CAN Europe and the European Environmental Bureau (EEB) in a two-year learning process.

The NGO community however still lacks own stable expertise in the field of energy and climate scenarios. A number of questions related to complex challenges of the energy transition remain open. On the one hand, this relates to the lack of own consistent facts and figures in view of influencing policies with hard data (e.g. civil society benchmarks for National Energy and Climate Plans). On the other hand, this relates to limited expertise in view of highly complex interlinkages of energy system transformations (e.g. choice and sustainability of renewables potentials, energy infrastructure needs, market design and macro-economic effects).

PAC project 1.0

November 2018-December 2020

Funding: German Federal Ministry for Economic Affairs and Energy

CAN Europe deliverable: [Aggregated PAC energy scenario for the EU28](#)

Other consortium members: EEB, REN21, RGI





5. Objectives

Under the recently granted PAC project 2.0, CAN Europe strives to improve the existing PAC scenario for the EU28

- By providing science-based answers to the cross-cutting challenges of energy transition (e.g. where to use which energy carriers in a sustainable way, where to build pylons or pipelines, how to keep the lights on and the homes warm, how much renewables and energy savings pay off...).
- By deriving national PAC scenarios for EU Member States and non-EU countries, providing details beyond the aggregated EU28 level.

CAN Europe's expectations with regards to the PAC scenario modelling exercise:

- Get a data-based benchmarking tool for policies. The updated and expanded PAC scenario will serve as NGOs' benchmarking tool for EU and national policies.
- Strengthen capacity building on energy transition challenges for NGO staff. The journey is the reward: CAN Europe plans to fill the abovementioned gaps by strengthening NGOs' own scenario building capacities. Staff from member organisations will be invited to join a series of scenario workshops to discuss key assumptions and exchange with external experts and modellers from the consultancy.

PAC project 2.0

September 2021
-August 2024



Funding: German Federal Ministry for Economic Affairs and Energy

CAN Europe deliverable: Modelling national PAC energy scenarios incl. analysis of macro-economic effects and energy infrastructure needs

Other consortium members: EEB, REN21, RGI

6. Deliverables

The following deliverables are to be carried out under the suggested contract duration. We indicate the minimum deliverables to be implemented as well as optional elements that might be integrated in the consultant's quote.

The modelling needs to build on the [existing PAC scenario dataset](#). The underlying key assumptions as endorsed by CAN Europe members and as described in the [PAC scenario technical summary](#) need to be respected when implementing the following deliverables.

We invite the consultant to make use of previously generated results from feeding the [PAC scenario dataset into the PyPSA-Eur-Sec open source model](#). Regarding EU-wide and country-specific carbon budgets in line with the Paris Agreement's 1.5°C objective, we suggest to reflect the recently published [Climate Analytics report on 1.5°C pathways for Europe](#), developed together with CAN Europe on the base of the PAC scenario key assumptions.

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6.1 Country-specific PAC scenarios

Minimum deliverables:

- a. Model an **optimised pathway** towards a 100% renewable energy system with net zero emissions in 2040 for the EU27 and the UK, providing the same data granularity like the [existing PAC scenario dataset](#); (sectoral resolution, granularity of energy carriers, interval);
- b. Derive country-specific data sets that **downscale the optimised pathway to the national level** from the aggregated EU-wide level to each of the EU27 Member States and the UK, keeping the sectoral resolution, granularity of energy carriers and interval;
- c. Add data about the **installed capacities** of electricity generation and for heat supply, of electricity and thermal storage and of electrolyser for the EU27 Member States and the UK;
- d. Add data about **country-specific and sector-specific greenhouse gas (GHG) emissions** under the optimised pathway, as well as all non-energy related emissions to illustrate 1.5°C compatible pathways towards net zero emissions for the EU27 Member States and the UK;
- e. Indicate how the optimised pathway would achieve the **EU climate and energy targets** (gross/net GHG emission reductions, share of renewables in gross final energy consumption (RES-GFEC), in electricity generation (RES-E), in heating and cooling (RES-H&C) and transport (RES-T), primary and final energy savings (EE-FEC and EE-PEC).

Optional deliverables:

- a. Model a set of **alternative near-optimal pathways** towards 100% renewable energy system with net zero emissions in 2040 for the EU27 Member States and the UK;
- b. Indicate how the optimised pathway(s) would translate into **National Energy and Climate Plan (NECP) indicators** (GHG emissions and removals, GHG gross emissions, emissions and removals from land use, land use change and forestry (LULUCF), GHG net emissions from industry, residential, tertiary, buildings, agriculture, energy and waste) for the EU27 Member States and the UK;
- c. Expand the minimum and/or optional deliverables to the **non-EU countries** covered by the Ten Year Network Development Plans (TYNDPs), i.e. Albania, Bosnia and Hercegovina, Kosovo, Montenegro, North Macedonia, Norway, Serbia and Switzerland.

6.2 Macro-economic indicators

Minimum deliverables:

- a. Calculate the **energy system costs**, the annual investments into energy savings and renewable energy technologies, import/export balance and avoided fossil fuel import costs from the optimised pathway for the EU27 Member States and the UK in five-year intervals;
- b. Provide indicators regarding **avoided costs of environmental damage** ('costs of inaction') from the optimised pathway for the EU27 Member States and the UK in five-year intervals.

Optional deliverables:

- a. Calculate the **employment effects** and the **impact on the gross domestic product** from the optimised pathway for the EU27 Member States and the UK in five-year intervals;
- b. Monetise the impact of the optimised pathway for the EU27 Member States and the UK on **specific energy costs** (levelised cost of electricity, levelised cost of heat);
- c. Calculate the **raw material demand** associated with the optimised pathway for the EU27 Member States and the UK in five-year intervals;
- d. Provide indicators regarding **avoided health costs** from the optimised pathway for the EU27 Member States and the UK in five-year intervals;
- e. Expand the minimum and/or optional deliverables to the **non-EU countries** covered by the TYNDPs

6.3 Infrastructure needs

Minimum deliverables:

- a. Derive **energy infrastructure needs and costs** related to the optimised pathway for TYNDP countries as a whole (interconnector capacities for electricity, gas and hydrogen, storage capacities, share of district heat networks in heat supply), indicate the utilisation rate of infrastructure, illustrate infrastructure needs in maps covering the TYNDP countries;
- b. Describe how the **flexibility options** (demand response capacities, different storage technologies, grid management and expansion, interconnectors, dispatchable fossil and renewable capacities) optimise the pathway environmentally and economically;
- c. Illustrate the **country-specific energy infrastructure needs** by describing the evolution of the national electricity grids, the gas and hydrogen networks of at least nine countries, deducing maps and recommendations for the national energy infrastructure planning.

Optional deliverables:

- a. Expand the environmental and economic analysis of infrastructure needs to the **alternative near-optimal pathways** towards 100% renewable energy system with net zero emissions in 2040 for the EU27 Member States and the UK;
- b. Illustrate the **country-specific energy infrastructure needs** by describing the evolution of the national electricity grids, the gas and hydrogen networks of more than nine countries, deducing maps and recommendations for the national energy infrastructure planning.

Menu card of deliverables

	<i>EU27 Member States and UK</i>	<i>Non-EU countries (AL, BH, CH, KS, ME, MK, NO, RS)</i>
6.1 Country-specific PAC scenarios		
Optimised pathway modelling	Minimum	Optional
Alternative near-optimal pathways modelling	Optional	Optional
Downscaling optimised pathway to national level	Minimum	Optional
Installed capacities	Minimum	Optional
Country-specific & sector-specific GHG emissions	Minimum	Optional
Achieving EU climate and energy targets	Minimum	Optional
Translate into NECP indicators	Optional	Optional

6.2 Macro-economic indicators		
Energy system costs	Minimum	Optional
Avoided costs of environmental damage	Minimum	Optional
Employment effects and impact on GDP	Optional	Optional
Specific energy costs	Optional	Optional
Raw material demand	Optional	Optional
Avoided health costs	Optional	Optional

6.3 Infrastructure needs		
Energy infrastructure needs and costs	Minimum	Minimum
Flexibility options	Minimum	Minimum
country-specific energy infrastructure needs	Minimum: at least nine countries	
country-specific energy infrastructure needs	Optional: more than nine countries	
Expand analysis to alternative near-optimal pathways	Optional	Optional

7. Key duties

The deliverables all need to be handed over as a data set published under an open licence. The format should facilitate the comparison of results with findings of ongoing parallel research projects such as the [1.5°C pathways project](#), the [UNIFY project](#) and the [LOCOMOTION project](#).

7.1 Method

Regarding the level of granularity of the modelling and the analysis of sector integration effects, the consultant ideally should run an hourly-based market model that mimics the European electricity and gas networks with at least one node per country, covering all physically interconnected TYNDP countries. A higher spatial resolution with sub-national nodes could be considered as an optional deliverable.



The range of exogenously defined parameters on the aggregated EU27 and UK level and on the national level is to be discussed in view of key assumptions and data provided by the existing aggregated PAC scenario for the EU28. The model should allow to define country-specific policy constraints and targets e.g. regarding the future share of certain renewable energy technologies or phase-out dates of certain fossil fuel technologies.

In order to provide complete figures for the entire EU27, the (partly) non-connected island Member States Cyprus and Malta also have to be covered consistently in the modelling.

7.2 Process

CAN Europe intends to organise an inclusive scenario building for the staff of its member organisations. In practice, a series of scenario workshops with up to 100 participants from member organisations and external experts will be hosted by CAN Europe to allow for an iterative process. The consultant is invited to present the most relevant input parameters and discuss with NGO staff the key assumptions influencing the modelling exercise.

National member organisations need to have sufficient background information and time to provide potentially valuable country-specific expertise and data. CAN Europe members also need to have an opportunity to comment on the draft results and on the final results before results are handed over and published.

Against this backdrop, the consultant will

- participate in at least six workshops or webinars during the contract duration to inform CAN Europe and its member organisations about the progress of the deliverables;
- suggest a standardised questionnaire or data input format to facilitate the collection of country-specific resources to be potentially provided by CAN Europe's national member organisations;
- visualise the generated data in an easily accessible online format to enable CAN Europe and staff of its member organisations to analyse the findings;
- discuss and integrate feedback from CAN Europe on the draft results and on the final results in at least two formal feedback loops during the contract duration.

All publications and communication have to be in English.

8. Milestones

3 December 2021	Deadline for potential consultants to send quotes to CAN Europe
January 2022	Start of the contract period
Q1/2022	Launch a standardised questionnaire or data input format to facilitate the collection of country-specific resources from CAN Europe's national member organisations

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Q1/2022	Scenario workshop I
Q3/2022	Scenario workshop II
Q4/2022	Presentation of first draft results from deliverables (see 6.1 to 6.2) to CAN Europe and its member organisations, launch first feedback loop
Q1/2023	Scenario workshop III
	Presentation of the final results, second feedback loop
Q2/2023	Scenario workshop IV
	Potentially launch country-specific PAC scenarios with macroeconomic indicators (and potentially country-specific infrastructure needs)
Q3/2023	Scenario workshop V
Q4/2023	Potentially launch country-specific energy infrastructure needs (see 6.3)
	Scenario workshop VI

The PAC project 2.0 lasts until Q3/2024 but the deliverables described under 6.1 to 6.3 have to be implemented before 2024 to respect the milestones suggested above. The contract duration thus would potentially last from 1 January 2022 to 31 December 2023. A further expansion until 30 August 2024 would be possible. Elements in this timetable are indicative and subject to further joint project planning of the consultant and CAN Europe.

9. Consultant profile

The consultant should meet the following selection criteria:

Skills and competencies:

- University degree in the field of energy and environmental economics, physics, engineering, geography or social sciences, with a minimum experience of three years in climate and/or energy scenario building and modelling
- Expert knowledge and proven track record in European energy system modelling, including the project management and lead of multi-stakeholder projects
- Capability to integrate carbon budget approaches in energy system modelling
- Experience in iterative scenario building processes with multi-stakeholder alliances, ideally from the NGO sector, proven project management skills
- Strong analytical skills with regards to the effects of sector integration and the optimisation of infrastructure needs
- Willingness to support the capacity building and strategic positioning of NGOs in energy and climate policies on the base of the deliverables
- Fluent in English

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Required documents:

- Explanation of tools and methods that the applicant plans to use for the implementation of the deliverables presented under 6.
- Explanation of the inclusive scenario building process in view of achieving the milestones suggested under 9.
- Proof of experience and proof of former projects lead by the potential consultant
- Graded price offer reflecting the minimum and optional deliverables. The quote should detail which optional deliverables could be taken over and to what extent additional costs occur with regards to the different mandatory and optional deliverables (6.1 to 6.3).
- Detailed personal plan presenting skills and competences of the consultant's staff members involved

Reference projects, reports or websites are welcome to substantiate the quote.

10. Application and contacts

Potential consultants are invited to send their quotes to CAN Europe by 3 December 2021.

CAN Europe will assess quotes based on the following selection criteria:

A. Price (30%)

B. Perceived quality (70%)

- Previous experience in European energy scenario building (33%)
- Suitability of tools and methods for the scenario building process (33%)
- Completeness and granularity of country-specific scenarios, macro-economic indicators and infrastructure needs (33%)

For any further questions and for sending your quote, please contact

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