



**Club Climate Europe**

Non-profit association (asbl)

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To: Ministry of Economic Affairs and Communications of the Republic of Estonia

Dear Minister, Mr. Tiit Riisalo,

Please find enclosed the proposal for cooperation with the Club Climate Europe, Belgium and with GERAD – HEC Montréal, Canada, aiming at integrated assessment modeling work for the energy, climate, and economic transition in Estonia.

We look forward to establishing good permanent cooperation with the Republic of Estonia, aimed to support the success of its green transition.

Annexes: 1. Presentation of the Club Climate Europe, and of GERAD – HEC Montreal.

2. Proposal for Integrated assessment modeling of energy, climate, and economic transition.

Respectfully,

Olivier Bahn, M. Ing., Ph.D.

Director, Group for Research in Decision (GERAD, HEC-Montréal)

Angele Kedaitiene, M. econ., Ph.D.

Secretary General of the Club Climate Europe



## Annex 1: Presentation of the Club Climate Europe and GERAD HEC-Montréal

### Club Climate Europe

Club Climate Europe is registered Belgian non-profit association (asbl), acting as the analytical center of European and global scale, specializing in green economic transition, climate change mitigation and adaptation, renewable energy, environment, and socioeconomics. The Club was established by several individuals from the EU, the USA, Asia, and Africa, working together for years before that.

The idea of the Club originates from the proposal of the Nobel Prize Winner Nordhaus, to establish Climate Clubs, which would be the vehicles of green transition around the globe. It also bears some ideas in of G-7, raised during the German presidency, to establish Climate Club for elaboration of the joint agendas.

The mission of the Club **is to foster the European and global climate and energy transition for the carbon emissions neutral world, while contributing also to the biodiversity, circular economy, digital transition, sustainability, geopolitics, socio-economic development of the countries, equality, inclusiveness, peace, and democracy.** The Club seeks to enhance the efficiency and implementation of green transition projects of various scales in different countries and industries, covered by climate goals.

According to the Statute, the Club aims at the following objectives:

- To become a leading non-political and non-partisan global institute for climate and energy analysis,
- To provide, encourage and promote research in climate and energy studies,
- To provide state-of-the-art user-friendly climate analytical tools,
- To provide climate education, based on specially designed courses for individuals and executives,
- To run advocacy, based on incorporating green investment tools into the economy, to promote sustainability and carbon neutrality,
- To raise public and private awareness about climate and energy transition, and climate analytics,
- To bring the Club to the notice of countries, local administrations and authorities, international organizations, and other agencies,

- To strengthen Transatlantic and Indo-Pacific cooperation with focus on climate and energy transition,
- Through exemplary work and cooperation, to facilitate the spread of European and Transatlantic values of peace, multilateralism, and humanity, across the globe,
- To raise funds through subscriptions or otherwise for all the purposes and objectives of the Club in such amounts and in such manner as may be authorized by the Executive Committee,
- To work with any national/international Organization/s whose aims are like those of the Club,
- To do all that is conducive to the attainment of the above objectives.

With expertise ranging from integrated assessment modeling to investment banking, from academia to NGOs, and from computer science to social science, from communications to discussion platform and diplomacy, the Club is well positioned to come up with innovative solutions on how to quantify social benefits and market return of environment-improving investment, on capacity building and synergies, effective networking, public value creation, acting across the regions, countries and continents, connecting to EU, USA, Canada, Indo-Pacific. Club enjoys good high-level contacts with the European Commission and the European Parliament, US State Department, Belgian, German, Spanish, Slovenian, Lithuanian, Indian, Nepalese, Turkish and other Governments.

The Club is run by a few bodies, - the General Assembly of its members and donors, which meets once per year, the Policy Board, headed by co-presidents Ruggero Arico, Selin Yilmaz, Marco Michal, Murat Orhan and Vikram Basyal, Executive Board, headed by the Secretary General Angele Kedaitiene, also – the advisory board, headed by Peter Hefele. Former European Commission Dr. Andrea Moggi serves as the Honorary President of the Club.

The Club cooperates with: Virginijus Sinkevicius – Commissioner for Environment, fisheries and oceans, Kamil Maj – European Parliament, Cabinet of President, Pierre Schellekens – European Commission, DG ENER, Oliver Bahn – GERAD HEC-Montreal, Howard Liebman – Jones day and Transparency International, Edward Saltzberg – GW University and Security and Sustainability Forum, Bernd Weber – EPICO, Diana Paula Gherasim – IFRI, Flavia Solazzo – Environmental defense fund, Kazys Starkevicius – member of Lithuanian parliament.

The Club focuses its work on the following organizations:

1. Government and Policy: Collaborate with governmental bodies at local, regional, and national levels to advocate for climate-friendly policies and regulatory frameworks. Engage in policy discussions, provide expert input, and promote sustainable practices.
2. Corporate Sector: Partner with businesses to assist them in adopting sustainable practices, reducing their carbon footprint, and aligning their strategies with climate goals. Provide consultation, workshops, and resources for green initiatives.
3. Education and Awareness: Work with educational institutions, NGOs, and community organizations to raise awareness about climate change, its impact, and sustainable lifestyle choices. Conduct workshops, seminars, and awareness campaigns.

4. Research and Innovation: Collaborate with research institutions and innovative startups to develop and implement cutting-edge solutions for climate mitigation and adaptation. Promote knowledge exchange and technology transfer.
5. Civil Society and Non-Governmental Organizations: Partner with NGOs and civil society organizations to enhance collective efforts in addressing climate change. Support joint initiatives, campaigns, and community-based projects.

### GERAD

GERAD is an inter-university research centre created in 1979 and bringing together specialists in data and decision sciences, computer scientists, applied mathematicians and mathematical engineers, mainly from HEC Montréal, Polytechnique Montréal, McGill University and the Université du Québec à Montréal. The team comprises more than 70 researchers from Quebec university departments, more than 30 associate researchers from various institutions or industry, nearly 20 research professionals and nearly 500 students at the Master's, Doctorate and Post doctorate levels.

GERAD aims to contribute to future developments in digital intelligence, and to maintain a world leadership role in prescriptive analysis. To make this happen, GERAD's objectives are to integrate artificial intelligence methods into mathematical decision sciences to improve modelling and accelerate solution algorithms; and, conversely, to improve machine learning techniques using mathematical optimization methods. GERAD also aims to increase its influence on the national and international scenes in line with its scientific achievements, to promote the use of mathematical decision support methods among all its potential users, thereby helping organizations address major environmental and social challenges.

GERAD's mission is:

- To develop the mathematics of decision-making in all its forms in complex systems – whether technological, commercial, or economic – and, upstream of decision-making, to develop modelling based on statistics, simulation, and data valuation;
- To train highly qualified personnel in the above fields, promoting equity, diversity and inclusion;
- To bring together university researchers and industry with a view to carrying out large-scale research and development projects, and to contribute to the international influence of Quebec research;
- To have a significant impact on society through scientific innovation, the transfer of know-how in important sectors of the economy, and the development of decision-making tools.

## **Annex 2: Proposal for Integrated assessment modeling of energy, climate, and economic transition**

Integrated assessment modeling of the energy and climate transition, also green transition of the economy, became the leading method to assess the climate scenarios and green transition pathways for countries worldwide, including European Union member states.

Integrated assessment models (IAMs) are used to describe a wide range of models, developed, and run by specialized global modeling centers, which vary by mathematical approach, geographical scope (global, national, and local), sectoral coverage, time horizon of the analysis, the way that they work and the questions they can answer.

There are macro-economic models, econometric, energy system models and more. The macro-economic models have representation of the economic impacts on society, while the energy system models have a better understanding of technologies' role in decarbonization. The most complex IAM models will look at the energy technologies, energy use choices, land-use changes and society behaviors decarbonize a system and prevent climate change.

GERAD HEC-Montreal is one of the leading global modeling centers, which has recently developed advanced generation of IAMs, much suitable for the small Baltic countries, and for Estonia specifically.

**In this respect, Club Climate Europe in close cooperation with GERAD HEC-Montreal proposes to the Republic of Estonia, to use the integrated assessment models and the corresponding consultancy, to assess the energy and climate transition scenarios and pathways to meet the goals of the European Green deal, the Paris agreement goals, leading towards net zero emissions by 2050.**

**CCE and GERAD propose to use two IAMs, - AD-MERGE and ETEM, both developed at HEC-Montreal, by the team led by prof. Oliver Bahn.**

AD-MERGE, an integrated assessment model that synergizes economic, environmental, and technological aspects. It uniquely incorporates climate adaptation strategies into its analysis, offering a holistic view of potential climate futures.

The AD-MERGE model, developed at GERAD research team is an advanced integrated assessment framework that includes a diverse set of modules to evaluate the interplay between climate policy, technological innovation, and economic development. The model features a hybrid structure that combines bottom-up technology details with top-down economic perspectives. At its core, AD-MERGE integrates a macroeconomic module that accounts for economic growth and the distribution of income, an energy module that details technology-specific characteristics within the energy sector, and a climate module that simulates climate dynamics and impacts. These are connected through a damage module that assesses economic costs associated with climate change.

Incorporating endogenous technological learning, AD-MERGE dynamically represents how technological advancements and learning curves affect the cost and adoption of new technologies

over time. The model is geographically disaggregated, allowing for the analysis of region-specific adaptation strategies and mitigation technologies. Interconnected modules of the model where the macroeconomic outputs feed into the energy module, which in turn informs the climate module, creating a feedback loop through the damage module that influences the macroeconomic decisions. This integration enables the evaluation of a full range of policy scenarios, from the adoption of novel energy technologies to the implementation of carbon pricing and regulatory measures.

GERAD also owns partial equilibrium model ETEM, which can be disaggregated into smaller regions, and can be ideal for focusing on the energy system and nationwide policies within this region. ETEM, part of the MARKAL-TIMES family, comprehensively models the energy sector, suggesting optimal technology and energy use combinations to meet demand cost effectively. It is suitable for detailed, high-resolution analysis, making it an excellent choice for the Baltic context. This model can be adapted to the Baltic region and potentially linked with AD-MERGE to incorporate global energy market feedback.

The ETEM model provides a comprehensive framework for assessing energy transition pathways, focusing on various technologies and energy sources, including hydrogen and renewable energy mixes. It's designed to analyze and suggest optimal combinations of technologies to meet energy demands efficiently and sustainably. The model is particularly useful for detailed, region-specific planning, offering insights into optimal capacity expansions and technology deployments that align with economic and environmental objectives. For the Baltic region, ETEM can deliver targeted analyses, supporting the development of effective energy policies and strategies. In the ETEM model, parameters for energy transition and economics, particularly for hydrogen and renewable energy mixes, can include the capacity factor of various energy technologies, investment costs, operational and maintenance costs, and emission coefficients. For example, when modeling hydrogen, parameters might cover production methods (electrolysis, steam methane reforming with CCUS), storage options, and usage sectors (transportation, industrial processes). For renewables, parameters could involve solar irradiation levels, wind speeds, turbine efficiency, and land availability, all crucial for determining the potential output and integration of these energies into the grid.

The modeling work would last for **about 12 to 18 months**, depending on the objectives. **The costs would need to be discussed.**

**Looking forward to the good cooperation!**