JOB VACANCY FOR AN ASSOCIATE LECTURER AT MINES PARISTECH
(CONTRACT DURATION: 6 MONTHS STARTING ON 1 MARCH 2018)

1 / THE CENTER'S MISSIONS:

The appointment is at the Center for Applied Mathematics (CMA), which is a research center of the Ecole des Mines de Paris and recognized for its expertise in prospective modeling for sustainable development. The CMA develops methodologies for producing multi-scale models (spatial and temporal) to address evolutions in the energy system. It develops models from the TIMES model generator, which is widely used in the international community. The CMA's research allows industrials to benefit from long-term decision-making tools and sheds light on potential choices facing government bodies. Thus since 2003, supported by the French Energy Council and then within the frame of the Modeling for Sustainable Development Chair, the CMA has worked on developing a prospective model aimed at guiding the direction of long-term energy strategies. This approach has allowed us to evaluate a number of scenarios and provide prospective analyses for France, and different regions of the world, as shown for example in [1, 2, 3, 4, 5].

The model employed (TIMES for country scale/TIAM-FR for global scale) is a prospective tool that can be used to obtain normative information based on analyses of scenarios reflecting different policies, measures and incentives concerning the energy system: it is based on optimizing, over a horizon of several decades, the discounted cost (technical, economic or environmental) of a technico-economic representation of the energy system under a demand satisfaction constraint. This representation comprises a detailed description of the energy chain, from top (production and energy supply) to bottom (economic sectors using final energy) and including all of the intermediate sectors that produce or consume energy.

[1] N. Maïzi, E. Assoumou, Future prospects for nuclear power in France, Applied Energy (2014), pp. 849-859, DOI information: 10.1016/j.apenergy.2014.03.056.
[2] V. Krakowski, E. Assoumou, V. Mazauric, N. Maïzi, Feasible path toward 40% - 100% renewable energy shares for power supply in France by 2050: A prospective analysis. Applied Energy 171 (2016) 501-522.
[3] P. Hugues, Edi Assoumou, N. Maïzi, Assessing GHG mitigation and associated cost of French biofuel sector: Insights from a TIMES model, Energy, Volume 113, 15 October 2016, Pages 288-300, ISSN 0360-5442.
[4] S. Postic, S. Selosse, N. Maïzi, Energy contribution to Latin American NDCs: Analyzing sub-regional trends with a TIMES model, Energy Policy, Volume 101, February 2017, Pages 170-184, ISSN 0301-4215.
[5] S. Kang, S. Selosse, N. Maïzi, Strategy of bioenergy development in the largest energy consumers of Asia (China, India, Japan and South Korea) Energy Strategy Reviews, 2015, 8, pp.56-65. <10.1016/j.esr.2015.09.003>

2 / MAIN JOB FUNCTIONS:

Apart from the standard teaching tasks of an associate lecturer, the main functions are as follows:

Based on technico-economic data and exogenous hypotheses on trends (demand, price of resources, discount rate, etc.), TIMES generates the evolutions (typically every five years up to 2050) of the main determinants of the **energy system**, i.e. impact of energy prices in the short and mid terms; estimation of pollution emissions; simulation of different technological and economic competitions; consideration of certain incentive measures to reduce greenhouse gas emissions; effect of breakthrough technologies; the role of energy-demand management measures; impact of the transport sector; impact of different research and development projects (energy performances, renewable energy projects, electricity demand management, etc.); consequences of energy policies, and makes it possible to analyze their variants.

Application to the African situation:

While this approach is widely employed to shed light on developing and emerging countries (e.g. China [6], India [7], the United Kingdom [8], Germany [9], Sweden [10], and the United States [11]) on the 2050 horizon, the African continent has only been subject to marginal long-term prospective studies employing a TIMES-type model.

The challenge is to apply this approach to the African situation, taking into account specific regional features: the energy supply, especially electricity, is extremely contrasted, due to the disparate resources present on the continent, i.e. gas and oil in the north, abundant water in the west, coal in the south, and the beginnings of a transport infrastructure in the east.

The task will thus involve disaggregating the continent to reflect these differentiation factors, while combining the constraint connected to collecting all of the data required to build the representation of the regionalized energy system.

In addition, the development challenges pursued by the continent, combined with the need to redeploy a sufficiently robust energy system to fulfill them, raise a number of questions on flexibility issues. These research studies should therefore integrate in particular:

- The question of integrating renewables and associated means of flexibility: while the non-carbonated aspect of these resources is now indisputable, their use on a wide scale, in a centralized and decentralized framework, raises the problem of managing the risk of temporal unavailability which will need to be solved beyond the backup capacities required to override the adverse impacts of intermittence. In particular, the deployment of infrastructures to support the ambition of developing industrial policies will require ensuring a high availability of energy supply, in other words its reliability [2, 10].
- Choices on the use of water in several sectors (energy, industry, agriculture) to explore the resulting tensions and how climate change is likely to exacerbate them.

[6] Huang Weilong, Yin Xiang, Chen Wenying, Prospective Scenarios of CCS Implementation in China's Power Sector: An Analysis with China TIMES, Energy Procedia, Volume 61, 2014, Pages 937-940, ISSN 1876-6102, http://dx.doi.org/10.1016/j.egypro.2014.11.999.

[7] Shweta Srinivasan, Nazar Kholod, Vaibhav Chaturvedi, Probal Pratap Ghosh, Ritu Mathur, Leon Clarke, Meredydd Evans, Mohamad Hejazi, Amit Kanudia, Poonam Nagar Koti, Bo Liu, Kirit S. Parikh, Mohammed Sahil Ali, Kabir Sharma, Water for electricity in India: A multi-model study of future challenges and linkages to climate change mitigation, Applied Energy, 2017, ISSN 0306-2619, http://dx.doi.org/10.1016/j.apenergy.2017.04.079.

[8] Francesco Fuso Nerini, Ilkka Keppo, Neil Strachan, Myopic decision making in energy system decarbonisation pathways. A UK case study, Energy Strategy Reviews, Volume 17, 2017, Pages 19-26, ISSN 2211-467X, http://dx.doi.org/10.1016/j.esr.2017.06.001.

[9] Markus Blesl, Anjana Das, Ulrich Fahl, Uwe Remme, Role of energy efficiency standards in reducing CO emissions in Germany: An assessment with TIMES, Energy Policy, Volume 35, Issue 2, 2007, Pages 772-785, ISSN 0301-4215, http://dx.doi.org/10.1016/j.enpol.2006.05.013.

[10] V. Krakowski, X. Li, V. Mazauric, N. Maïzi, Power system synchronism
in planning exercise : From Kuramoto lattice model to kinetic energy aggregation, Energy Procedia (2017) pp. 2712-2717 DOI information : 10.1016/j.egypro.2017.03.921. <hal-01439643>.

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3 / CANDIDATE PROFILE:

The candidate should have a PhD specializing in one of the following: Economics / Optimization/ Modeling-Prospective.

He or she should be competent in prospective modeling with significant experience of using MARKAL/TIMES.

4 / APPLICATIONS

Applications should include the following:

- A cover letter,
- A detailed résumé,
- The name and contact details of three scientific referees who may be contacted to give their opinion on the candidate's research and skills.

Applications should be sent by **Monday 6 November 2017 at the latest** to the following address:
Centre de Mathématiques Appliquées - MINES ParisTech,
1, rue Claude Daunesse, CS 10 207, 06904 Sophia Antipolis Cedex, France
FAO Nadia MAÏZI, Director of the Center
and/or by e-mail to recrutement@groupes.cma.mines-paristech.fr.