

<b>Position</b>	<b>ESR2.3</b>		
<b>Title</b>	Robust management and control of smart multi-carrier energy systems		
<b>Centre</b>	Delft University of Technology (TU Delft, <a href="http://www.tudelft.nl">www.tudelft.nl</a> )		
<b>Location</b>	Delft, The Netherlands		
<b>Start date</b>	1 July 2016	<b>Duration</b>	48 months
<b>Closing date for applications</b>	<b>6 March 2016</b>		
<b>Communications of results</b>	<b>15 May 2016</b>		

## Job description

### Individual Research Project

The objective of this Individual Research Project is to develop novel robust control methods for large-scale systems. As application, the project will focus on balancing demand, supply, and in particular storage and conversion in smart mixed electricity/gas networks. The central idea in such smart multi-carrier energy systems is to install small to medium-size local energy storage systems (based on batteries, capacitor banks, or flywheels) and conversion units (based on natural gas and/or hydrogen) at the street, district, and city level. In order to deal with the large-scale nature of such systems, the ESR will adopt a multi-level and distributed control approach, where local control agents act and interact at each control level to jointly reach the best possible performance.

In particular, the aim is to develop robust multi-level and distributed control methods that guarantee convergence of the local control agents to a set of consistent control actions in the presence of various kinds of disturbances. In addition, the project will develop algorithms that provide a balanced trade-off between computational efficiency and optimality. This will then result in fast and efficient robust control methods for balancing demand, supply, storage and conversion in smart multi-carrier energy systems that will enhance the flexibility, efficiency, and sustainability of smart grids.

### Tasks

- Developing robust control methods for balancing demand, supply, and in particular storage and conversion in mixed electricity/gas networks.
- Developing multi-level and distributed control methods that guarantee convergence of the local control agents to a set of consistent control actions.
- Developing algorithms that provide a balance between computational efficiency and optimality.

### Career

In Marie Skłodowska-Curie Actions, ESRs are paid a competitive salary, including a Mobility Allowance and a Family Allowance (subject to family situation). The successful candidate will be working on an Individual Research Project (IRP) at the Delft Center for Systems and Control (DCSC) of TU Delft and will have secondments related to their research at Universitat Politècnica de Catalunya (UPC, [www.upc.edu](http://www.upc.edu)) and 3E (3E, [www.3e.eu](http://www.3e.eu)). She/he will be enrolled in the TU Delft PhD programme and conduct the research corresponding to the IRP at DCSC as part of her/his thesis. Tuition fees will be covered by the fellowship and the network will also support training activities and periodical events, which will allow the ERSs to develop their career in a multi-sectorial environment and to obtain a wide knowledge on the control of electrical networks.

### PhD Programme

The successful candidates will be enrolled in the PhD programme of the TU Delft Faculty Graduate School (<https://intranet.tudelft.nl/en/3me/organisation-services/graduate-school-3me>).

### Supervisor

Bart De Schutter ([www.dcsc.tudelft.nl/~bdeschutter/](http://www.dcsc.tudelft.nl/~bdeschutter/))

Joris Sijs



## Planned secondments (compulsory)

The ESR will perform secondments at UPC (Barcelona, Spain) and 3E (Brussels, Belgium), which will be less than 30% of the total employment time.

## Eligibility conditions

1. The candidate must not have resided or carried out his/her main activity (work, studies, etc.) in **THE NETHERLANDS** for more than 12 months in the 3 years immediately prior to his/her recruitment under the project (short stays such as holidays are not counted).
2. The candidate must be within 4 years of the diploma granting you access to doctorate studies at the time of recruitment and has not yet been awarded the doctorate degree.
3. The candidate may be of any nationality.
4. The candidate must work exclusively for the project during the employment contract.
5. The candidate must fulfil the conditions to be admitted in the PhD programme of the TU Delft Faculty Graduate School.

**These conditions must be fulfilled at the starting date of the contract. The starting date for each position is tentative.**

## General requirements

### Education Degree

To be eligible for the 3mE PhD programme of the TU Delft Faculty Graduate School, the candidate must

1. have an MSc degree or equivalent
2. proven proficiency in the English language (e.g. being a native speaker or having a TOEFL score of at least 100 or an IELTS score of at least 7).

### Qualifications

Preference will be given to candidate with a master degree (or equivalent) in systems and control, applied mathematics, electrical engineering, or a related field.

### Language

**English:** Good communication skills both oral and written.

### Experience

Desirable background in one or more of the following topics:

- robust control
- numerical optimization
- smart energy networks
- model predictive control
- distributed control
- multi-agent systems
- power grids

### Skills

- Strong motivation to pursue a PhD degree.
- Ability to work independently and as part of a team.
- Excellent skills in writing and presentation.



- Highly-motivated with the ability to set and meet deadlines appropriate to the progress of the project.
- Willingness to travel and to interact closely with the INCITE partners.
- Willingness to work on the boundary of several research domains.

### Job details

<b>Gross salary</b>	Between € 2146 and € 2744 per month depending on the family situation (amounts subject to taxation according to the Dutch law). The position covers tuition fees and other training expenses.
<b>Duration</b>	48 months
<b>Type of contract</b>	Full-time
<b>Hours per week</b>	38 hours
<b>Place of work</b>	Delft
<b>Province/State</b>	South Holland
<b>Local language</b>	Dutch
<b>Country</b>	The Netherlands

The contract will be subject to the regulations of the Marie Skłodowska Curie Innovative Training Network Fellowships of the European Commission and in accordance with the work contract regulations of the Netherlands.

### Selection criteria

- Fit with general requirements listed above
- Motivation for selecting this project and for selecting TU Delft
- Background and expertise should fit the given topic
- Fit within the current team
- Communication and presentation skills
- Ability to work both independently and within a team
- Ability to overcome and solve problems

After the first selection stage, the top five candidates will be invited to a remote interview via video conference.

**Equal consideration will be given to female and male applicants.**

### Applications

All applications must include:

1. The **application form** (INCITE template).
2. A detailed **CV**, including list of publications, a Master thesis summary and the names of two referees (name, title, affiliation, e-mail and telephone number(s)) who are willing to provide detailed recommendation letters about the candidate ( INCITE template).
3. One **motivation letter** for each position applied for (INCITE template).
4. **Copies of academic transcripts and degree certificates**, in English.





## *ESR Job Vacancy*

All applications must be submitted by means of on-line application on the official website of INCITE - [www.incite-itn.eu](http://www.incite-itn.eu) using the templates available in the website.

For further information: [coordinator-incite@irec.cat](mailto:coordinator-incite@irec.cat).



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