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General Informations

Reference

2019-

Job offer

Recruitment

Institute

CEA's Institute, the LITEN (Innovation Lab for New Energy Technologies), is one of the most important European research centers on new energy technologies.

The Department of Solar Technologies (DTS) has the mission to develop solar photovoltaic and thermal technologies and integrate them into systems.

Its technical facilities are located within the National Institute of Solar Energy (INES) in the Bourget-du-Lac site (73370)

Laboratory

The LSPV (laboratory of photovoltaic systems) has been working since 2013 according to two technological axes in power electronics. The first concerns the development of special power electronics topologies in order to simplify the electrical energy conversion chain. The second is the rise in voltage of the systems, to drastically reduce the amount of metal used and also remove elements of the conversion chain of electrical energy. GaN and SiC power semiconductor switch technologies are the main way of improvement of the static conversion technologies currently built with silicon switches, and are systematically implemented in LSPV research programs. The research activities are structured according to five programs. The first is micro-inverter technology; devices for converting the energy produced at the scale of a photovoltaic module. Program 2 relates to current source inverters, where a direct voltage step-up conversion is possible with a high efficiency. Voltage source inverters in 1500V_{DC} are treated in program 3 through numerous topologies (NPC, FC ...). Medium voltage technologies are included in the program 4 where an experimental plant equipped with PV 3kV_{DC} string is installed on the rooftop of the INES. The control algorithms for the interconnection of the power electronics with the network (MPPT, anti-islanding, LVRT ...) are finally treated in the program 5.

Description du poste

Domaine

Power electronics.

Intitulé de l'offre

Photovoltaics power electronics engineer (high power / medium voltage)

Keywords: power electronics, silicon carbide, medium voltage, energy storage systems, voltage source inverter

Contract

Limited time contract

Professionnel status

Executive

Last of the contract

3 years

Job description

Background of the topic :



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The European project TALENT proposes a future electricity network where many power generation groups with very different power ranges are associated to create an energy system in which the strong penetration of renewable energy sources makes the energy storage systems electric batteries become the main source to ensure the stability of the network. To facilitate the integration of batteries in the network, the TALENT project focuses on reducing the cost of hardware and software required for installation and management at three power scales: building, neighborhood and utilities. The topics studied for cost reduction are : the battery-connected power electronics and the decentralized hybrid energy systems management software. The architecture of the system will be designed as a whole, from the battery to the electrical energy management systems. To reduce the amount of materials and reduce the cost of the technology, a high-voltage energy storage system is proposed. The new technology is based on a battery pack delivering a voltage of approximately $3kV_{DC}$ connected to a silicon carbide (SiC) voltage source inverter injecting power under high voltage ($1500V_{RMS-3\sim-50Hz}$ L/L).

Work to be done :

- Simulation / modeling of the power electronics topology associated with a battery (including the EMC analysis)
- Sizing of SiC power modules and optimization of the stray inductance
- Manufacture and development of a gate driver for SiC module with a high immunity
- Design of a low inductive busbar
- Characterization of power modules
- Assembly of the converter (including cooling device and filters)
- Characterization of the power converter

Required Skills :

- Static converters
- Photovoltaics electrical engineering
- Power electronics
- Power electronics control loops
- Dielectric materials
- EMC

Design tools:

- PSIM, PLECS
- ALTIUM
- SOLIDEDGE
- MATHCAD
- ANSYS: Q3D
- ANSYS: ICEPACK
- dSPACE

Professional qualifications required:

- Scientific Righteousness
- Autonomy
- Constructive
- Sense of proposal
- Creativity
- Personal willingness to go beyond the state of the art

Localisation du poste

Site

Institut National de l'Energie Solaire



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Localisation du poste

France, Rhône-Alpes

Lieu

50 avenue du Lac Léman | F-73375 Le Bourget-du-Lac

Critères candidat

Languages

English, French, Spanish (option)

Education

PhD in power electronics

Programme

Segment CEA

Suivi par

Responsable principal

Chrystelle SINDT / Catherine BOUR

Demandeur

Jérémie AIME, head of the photovoltaic systems laboratory (LSPV)

Contact : jeremie.aime@cea.fr

Availability of the job : Immediate

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