

The University of Queensland - IIT Delhi Academy of Research (UQIDAR)

Joint PhD Project Proposal Template

1. Project details

Project title

IoT based EV infrastructure: Data Driven Approach for analysis and optimization of Distribution system Operation (DSO) under uncertainties

Project ID

UQIDAR-00152

2. Supervision team

Please visit the IITD website www.iitd.ac.in and UQ website <http://researchers.uq.edu.au/> to highlight potential collaborators that would be best suited for the proposed project. Complete where possible – advise if you’d like assistance establishing contacts.

	University of Queensland	IIT Delhi	External/Industry (if applicable)
Supervisor name and title	Prof. Tapan K Saha	Prof. Sukumar Mishra and Dr. Ashu Verma	
School or department (or company, if applicable)	School of Information Technology & Electrical Engineering	Electrical Engineering Department and Centre for Energy Studies	
Phone number	+61 422001378, +61 7 33653962	0112659-1074, 011 2659-1266	
Email-ID	saha@itee.uq.edu.au	sukumar@ee.iitd.ac.in , averma@ces.iitd.ac.in	
URL for more info	http://researchers.uq.edu.au/researcher/83		

3. Other supervisors

Please provide information about other associate supervisors below.

Full name and title(s):
School/department/company details:
Phone:
Email:
URL:

2. Field Of Research (FOR) codes

Specify up to four four-digit FOR codes for your project – see [here](#) for more detail on FOR codes.

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4.

3. Keywords

Please choose up to 4 keywords for your project. E.g. Nanotechnology, data science, novel batteries, etc. Keywords will assist in classifying project and presenting projects to students on the applications portal.

1 Distribution System

3 Uncertainties

2 Electric Vehicle

4.

4. Discipline background of candidate

Please outline the preferred background of your student. E.g. Organic chemistry, physiology, topology, CFD, etc. This will assist in presenting projects to applicants on the apps portal.

1 Electrical Engineering, Power Systems	3 Optimisation knowledge
2 Knowledge in control systems	4.

5. Project description

Traditionally, the distribution systems are designed for uni-directional power flow with power source elsewhere and are always connected to transmission system. Also, the changes in system configuration were not too frequent. Introduction of renewable energy based distributed generations (DGs), battery energy storages, and electric vehicles (EVs) is changing the overall structure and conventions of the traditional distribution systems. Various market mechanism and more pronounced role of distribution system operator (DSO) is emerging due to multiple ownership and need for demand response (DR) till individual house hold level. The biggest challenge in distribution systems is the availability of data and network information for accurate state estimation and modelling. An indirect approach using measurement/historical data to determine the network configuration/other states needs to be explored. Further for more data availability low cost measurement, accumulation and storage should be explored. Uncertainties in PV/EV can be complementary and should be seen as opportunity for balancing each other's effect along with already existing natural storage in distribution system. The IoT based platform can provide data in the cloud base which can be further used to develop predictive models for distribution network under various uncertainties. Emphasis in this project will be to develop 1) low cost measuring infrastructure for LV distribution system with EV penetration 2) Data driven approach for determining the distribution system models 3) Optimal scheduling and voltage management in weak distribution systems with large EV penetration utilizing V2G and G2V operations

6. Project deliverables/outcomes

1. Cloud based data management for LV distribution networks reducing the need for expensive metering
2. Algorithms for DSO operations in the presence of renewable generation and EV at LV level

7. Research impact themes

Highlight the research impact theme(s) this project will address. Feel free to nominate more than one. For more information, see <http://www.uq.edu.au/research/impact>

1. Healthy Ageing
2. Feeding the World
3. **Resilient Environment** ✓
4. **Technology for Tomorrow** ✓
5. Transforming Societies

8. Type of student

This project is best suited for an:

i-student	<input checked="" type="checkbox"/>
a-student	<input type="checkbox"/>
i- or a-student	<input type="checkbox"/>

Please note that:

- an i-student will be expected to spend year-1 at IIT-D, year-2 at UQ and the remaining time at IIT-D.
- an a-student will spend year-1 at UQ, year-2 at IIT-D and the remaining time at UQ.
- All students will be required to complete some amount of coursework in their first year.

9. Student capabilities and qualifications

Essential capabilities:

Programming in Matlab/Python

Desirable capabilities:

Knowledge of machine learning techniques, power system analysis and optimization

Expected qualifications (Courses, degrees, etc.):

B.Tech (Electrical), M.Tech (Power System, Energy Studies) from IIT's or from other reputed universities.