International MINTernship-Program

Projects available at UNCC

Spring 2016

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# RESILIENT SELF-HEALING DISTRIBUTION NETWORKS

## Abstract of the project

The objective of this project is to improve power system distribution network resiliency solution to enhance responsiveness and faster restoration of power to loads. The main concepts of this proposal are to optimize the distribution network configuration and constrain resource distribution in order to maximize the availability of power to critical loads through Wireless Sensor Network (WSN)-enabled DERs. This is known as fault location, isolation and service restoration (FLISR) system. The solution considers modern distribution network features with extensive use of DER as well as the emerging concept of a microgrid operating within a WSN.

## Tasks

It will vary from day to day, but the daily activities would comprise of some or all of the following: Literature review, attending meetings or seminars, writing reports/papers, making presentations, software/algorithm development, working in the lab.

## Requirements

Graduate student standing; Power Engineering; communications and control engineering.

## Language Skills

Fluency in English

## Software Skills

Experience with Matlab, power analysis software (PowerWorld, or DigSilent, or ETAP, or PSCAD, etc.)

## Other skills

n/a

## Minimum Duration of the project

Up to six months

## Type of research project

Project in a research institute

## Responsible Professor

Dr. Badrul Chowdhury

## Supervisor/Mentor of the project

SAME

## Supervisor’s Telephone Number

704-687-1960

## Supervisor’s Email

b.chowdhury@uncc.edu

## Faculty, Institute or Name of the Company

UNC Charlotte - EPIC
## 2. HYBRID (DC + HIGH FREQUENCY AC) GRID FOR RESIDENTIAL SYSTEM

**Abstract of the project**

This project is to construct and test a prototype of a HybridGrid system. Modern conventional houses are fed from alternating current (AC). However, at the same time, many appliances and lighting technologies, such as televisions, computers, and LED light fixtures, are native DC loads, as are electric vehicles, batteries, fuel cells, and renewable sources. These and other appliances are fed from multistage power-conversion equipment that first rectifies the incoming AC into DC. Usually, this is followed by a second DC-to-DC converter stage that converts the rectified DC voltage into a lower regulated voltage as required by the end load (e.g., 12VDC or 5VDC in personal computers). Each of these conversions wastes electricity in the form of heat. A DC house is a new concept, where the power distribution system is built around DC instead of the conventional AC system. The DC house can be fed from the AC electric utility grid (i.e., grid-parallel operating mode) or can be intentionally disconnected from the grid to function as a self-sustaining entity. HybridGrid combines such a DC house distribution system along with an additional high frequency AC distribution system. This high frequency AC grid is employed to perform inter-house power transfer, thus eliminating the dependence on the conventional low frequency AC electric utility grid.

**Tasks**

1. Assist the faculty member in analysis, modeling, simulations, and experimental work as required in the project.
2. Assist the faculty member in documenting results of the analysis and in creating periodic project reports.
3. Assist the faculty member in creating status update presentations and in presenting the same to the project sponsor.
4. Assist the faculty member in creating a final project report.

**Requirements**

- Electrical Engineering, Electronics, Computer Engineering
- Fluency in English

**Software Skills**

- Power Electronics, Embedded Controls, Communications, Analog and Digital Electronic Circuit Design, Prior working experience with power devices such as MOSFETs and IGBTs, and embedded processors such as micro-controllers and DSPs

**Minimum Duration of the project**

- up to six months

**Type of research project**

- Project in a research institute

**Responsible Professor**

- Madhav Manjrekar

**Supervisor/Mentor of the project**

- Madhav Manjrekar

**Supervisor’s Telephone Number**

- 704-687-1003

**Supervisor’s Email**

- mmanjrek@uncc.edu

**Faculty, Institute or Name of the Company**

- UNC Charlotte - EPIC
# 3. Low Cost Distributed Inverter for Solar Generation System

## Abstract of the project

This project is to construct a prototype of a Low Cost Distributed Inverter (LCDI) for solar PV panels and test it in the laboratory and in actual solar power generation plant. An LCDI unit is placed onto the back of each solar PV panel to convert the DC voltage output of that panel to a switched quasi-square wave voltage with variable pulse width. When these voltages are aggregated across multiple panels connected in a series string, they synthesize an AC waveform that can be interfaced with the power grid. The inverter functionality is distributed along the string, with no micro-inverter, no central inverter, and no voltage boosting required. The LCDI represents the best of both worlds in inverter concepts. Like micro-inverters and solar optimizers, the LCDI enables panel-level MPP tracking to achieve 10-15% greater energy yield under non-uniform conditions than central inverters. Also like micro-inverters, the LCDI avoids the use of large electrolytic capacitors that can severely limit lifetime in central inverters. When illumination is uniform across the string of panels, the LCDI enjoys the high efficiency of string inverters – up to 98%. The control system switches into a mode where each LCDI independently acts like a low-power, low voltage pulse-width modulated string inverter. The switching, conversion, and filtering requirements in an LCDI are much simpler than in micro-inverters and solar optimizers. As a result, an LCDI bill of materials consists of ~20 components rather than the 150-450 of other module-level electronics.

## Tasks

1. Assist the faculty member in analysis, modeling, simulations, and experimental work as required in the project.
2. Assist the faculty member in documenting results of the analysis and in creating periodic project reports.
3. Assist the faculty member in creating status update presentations and in presenting the same to the project sponsor.
4. Assist the faculty member in creating a final project report.

## Requirements

- Electrical Engineering, Electronics, Computer Engineering

## Language Skills

- Fluency in English

## Software Skills

- Power Electronics, Embedded Controls, Communications, Analog and Digital Electronic Circuit Design, Prior working experience with power devices such as MOSFETs and IGBTs, and embedded processors such as micro-controllers and DSPs

## Minimum Duration of the project

up to six months

## Type of research project

Project in a research institute

## Responsible Professor

Madhav Manjrekar

## Supervisor/Mentor of the project

Madhav Manjrekar

## Supervisor’s Telephone Number

704-687-7003

## Supervisor’s Email

mmanjrek@uncc.edu

## Faculty, Institute or Name of the Company

UNC Charlotte EPIC
## Abstract of the project

VPPs do represent a possibility for the utility of the future with high penetration of distributed power, energy storage and renewables. The large-scale integration of renewable energy and energy storage systems have introduced many technical and economic challenges. High levels of installed renewable capacity might reduce grid stability and power quality. Increased adoption of renewables and energy storage by customers on the distribution level might lead to new business models for the utilities. The VPP concept has the potential to provide both technical and economic solutions to the integration of distributed generation. The distributed resources on a utility distribution system collectively work as an integrated power generating system as a VPP with smart control algorithms and real-time analytics. The proposed VPP has forecast and analytics capability with distributed electrical resources and components integrated through an integrated dispatch and control system. The load and resource forecast generates the dispatch schedule for power production and ancillary services for each resource on the VPP and loads. This is done by taking historical load and weather data, models of the VPP resources, demand response, market data and the weather forecast as inputs. The electrical systems controllers use the dispatch schedule to regulate power production from each individual resource and loads. Grid frequency regulation, voltage-VAr support and inertia emulation techniques are implemented. A demonstration VPP with solar photovoltaic, battery energy storage, loads, demand response, analytics and forecasting capability, is presented and implemented using a real-time digital simulator and scaled hardware in the loop (HIL) components. The results validate the VPP performance with load forecasting, power production, demand response and generator inertia emulation. With this demonstration system, individual small-scale power stations will collectively work as a virtual power plant, enabled to participate in energy markets for both power production and ancillary services.

## Tasks

Students will work with power modeling and may work on real-time system models simulating and forecasting power production and energy storage. Students will integrate hardware like PV inverters, energy storage and distributed resources on a Hardware-in-the-Loop (HIL) laboratory.

## Requirements


## Language Skills

Fluency in German, Fluency in English

## Other skills

n/a

## Minimum Duration of the project

up to six months

## Type of research project

Project in a research institute

## Responsible Professor

Johan Enslin

## Supervisor/Mentor of the project

Johan Enslin

## Supervisor’s Telephone Number

704-687-5397

## Supervisor’s Email

jenslin@uncc.edu

## Faculty, Institute or Name of the Company

UNC Charlotte EPIC
## VIRTUAL POWER PLANT (VPP) CONTROL & OPERATIONS #2

### Abstract of the project
VPPs do represent a possibility for the utility of the future with high penetration of distributed power, energy storage and renewables. The large-scale integration of renewable energy and energy storage systems have introduced many technical and economic challenges. High levels of installed renewable capacity might reduce grid stability and power quality. Increased adoption of renewables and energy storage by customers on the distribution level might lead to new business models for the utilities. The VPP concept has the potential to provide both technical and economic solutions to the integration of distributed generation. The distributed resources on a utility distribution system collectively work as an integrated power generating system as a VPP with smart control algorithms and real-time analytics. The proposed VPP has forecast and analytics capability with distributed electrical resources and components integrated through an integrated dispatch and control system. The load and resource forecast generates the dispatch schedule for power production and ancillary services for each resource on the VPP and loads. This is done by taking historical load and weather data, models of the VPP resources, demand response, market data and the weather forecast as inputs. The electrical systems controllers use the dispatch schedule to regulate power production from each individual resource and loads. Grid frequency regulation, voltage-VAr support and inertia emulation techniques are implemented. A demonstration VPP with solar photovoltaic, battery energy storage, loads, demand response, analytics and forecasting capability, is presented and implemented using a real-time digital simulator and scaled hardware in the loop (HIL) components. The results validate the VPP performance with load forecasting, power production, demand response and generator inertia emulation. With this demonstration system, individual small-scale power stations will collectively work as a virtual power plant, enabled to participate in energy markets for both power production and ancillary services.

### Tasks
Students will work with power modeling and may work on real-time system models simulating and forecasting power production and energy storage. Students will integrate hardware like PV inverters, energy storage and distributed resources on a Hardware-in-the-Loop (HIL) laboratory.

### Requirements

### Language Skills
Fluency in German, Fluency in English

### Software Skills

### Minimum Duration of the project
up to six months

### Type of research project
Project in a research institute

### Responsible Professor
Johan Enslin

### Supervisor/Mentor of the project
Johan Enslin

### Supervisor’s Telephone Number
704-687-5397

### Supervisor’s Email
jenslin@uncc.edu

### Faculty, Institute or Name of the Company
UNC Charlotte
### Abstract of the project
This project is integrating an energy storage management scheme to maximize potential value for energy storage that can be brought forth to medium voltage feeders. In general, the potential performance benefits produced by possible energy storage applications include improved system reliability, inertia and spinning reserves, frequency regulation, transmission and distribution (T&D) capacity enhancement and deferrals and energy arbitrage to minimize peaks. Here we propose a unique control algorithm that enhances coordination of all the ancillary services applications, voltage-VAr support along with renewables capacity firming and ramp-rate control. Optimization of control parameters, set-points and resource forecasting should be developed to maximize energy storage lifetime and revenue streams through ancillary services. The design needs to be tested on a Real-time Dynamic Simulation and forecasting platform which shows that the performance of the different functions.

### Tasks
Students may expect to have a power system modeling experience and may work on real-time system models simulating and forecasting power production and energy storage. They may also integrate hardware like PV inverters, energy storage and distributed resources on a Hardware-in-the-Loop (HIL) laboratory.

### Requirements
- **Electrical Power Engineering (MS Student)**
- **Language Skills** Fluency in German, Fluency in English
- **Software Skills**
- **Other skills** BS Engineering with skills in energy analytics, power electronics, energy storage and renewable energy integration
- **Minimum Duration of the project** up to six months
- **Type of research project** Project in a research institute
- **Responsible Professor** Johan Enslin
- **Supervisor/Mentor of the project** Johan Enslin
- **Supervisor’s Telephone Number** 704-687-5397
- **Supervisor’s Email** jenslin@uncc.edu
- **Faculty, Institute or Name of the Company** UNC Charlotte EPIC
**Abstract of the project**
The Energy and Environmental Assistance Office (EEAO) provides technical services for government agencies, industries, and consulting firms. These projects include the opportunity for experiential learning in developing solutions for “real-world” issues within the energy and environmental sectors. The project topics include bioenergy; energy planning and assessments; air quality and air sensor/equipment evaluations; water/wastewater processes, water resources, and water quality; solid waste and resource recovery; workforce development; and sustainability. The projects involve working directly with clients outside of the university to develop methodology, provide results and conclusions within technical reports, and deliver presentations. The Sustainability, Energy, and Environmental (SEE) internship will provide a balanced and interactive learning experience.

**Tasks**
The EEAO SEE intern can expect to spend their time at UNC Charlotte working within a variety of client based technical services projects. It would be a goal of the EEAO to provide an extensive experiential learning opportunity which allows the interns selected to be involved within the energy and environmental sectors. The day to day experience may involve:

a) Seeking literature and website information which provides governmental agency representatives a broad overview on their topics of interest,

b) Field data gathering on environmental factors such as composting, marketing survey studies for customer behavior, construction resources generated during building single family residential homes, workforce development surveys, focus groups, or other topics,

c) Laboratory research to investigate the process limitation factors of composting water treatment residuals, wastewater treatment process total organic carbon content evaluation, or other topics,

d) Working within a team setting for meeting client deliverables within modeling results, writing reports, and/or dissemination of information to the greater public on project results.

In addition, interns may be involved with project meetings (both internal and external), conferences, and outreach booths.

**Requirements**
- Civil Engineering
- Environmental Engineering
- Electrical Engineering
- Chemistry, Biology, or Environmental Science
- Business and/or Communication

**Language Skills**
Fluency in English

**Software Skills**
Technical/Scientific
Modeling expertise
Excel and Database
Technical writing

**Other skills**
Interest in working within a diverse team to provide solutions on energy, environmental, and sustainable issues
Capability to interact with others in exchanging information both in a technical and non-technical setting

**Minimum Duration of the project**
up to six months

**Type of research project**
Project in a research institute

**Responsible Professor**
Regina Guyer

**Supervisor/Mentor of the project**
Regina Guyer

**Supervisor`s Telephone Number**
704-687-1934

**Supervisor`s Email**
rguyer@uncc.edu

**Faculty, Institute**
UNC Charlotte EPIC
# 8. ENERGY AND ENVIRONMENTAL SERVICES #2

## Abstract of the project
The Energy and Environmental Assistance Office (EEAO) provides technical services for government agencies, industries, and consulting firms. These projects include the opportunity for experiential learning in developing solutions for “real-world” issues within the energy and environmental sectors. The project topics include bioenergy; energy planning and assessments; air quality and air sensor/equipment evaluations; water/wastewater processes, water resources, and water quality; solid waste and resource recovery; workforce development; and sustainability. The projects involve working directly with clients outside of the university to develop methodology, provide results and conclusions within technical reports, and deliver presentations. The Sustainability, Energy, and Environmental (SEE) internship will provide a balanced and interactive learning experience.

## Tasks
The EEAO SEE intern can expect to spend their time at UNC Charlotte working within a variety of client based technical services projects. It would be a goal of the EEAO to provide an extensive experiential learning opportunity which allows the interns selected to be involved within the energy and environmental sectors. The day to day experience may involve:

- a) Seeking literature and website information which provides governmental agency representatives a broad overview on their topics of interest,
- b) Field data gathering on environmental factors such as composting, marketing survey studies for customer behavior, construction resources generated during building single family residential homes, workforce development surveys, focus groups, or other topics,
- c) Laboratory research to investigate the process limitation factors of composting water treatment residuals, wastewater treatment process total organic carbon content evaluation, or other topics,
- d) Working within a team setting for meeting client deliverables within modeling results, writing reports, and/or dissemination of information to the greater public on project results.

In addition, interns may be involved with project meetings (both internal and external), conferences, and outreach booths.

## Requirements
- Civil Engineering
- Environmental Engineering
- Electrical Engineering
- Chemistry, Biology, or Environmental Science
- Business and / or Communication

## Language Skills
- Fluency in English

## Software Skills
- Technical/Scientific
- Modeling expertise
- Excel and Database
- Technical writing

## Other skills
- Interest in working within a diverse team to provide solutions on energy, environmental, and sustainable issues
- Capability to interact with others in exchanging information both in a technical and non-technical setting

## Minimum Duration of the project
- up to six months

## Type of research project
- Project in a research institute

## Responsible Professor
- Regina Guyer

## Supervisor/Mentor of the project
- Regina Guyer

## Supervisor’s Telephone Number
- 704-687-1934

## Supervisor’s Email
- rguyer@uncc.edu

## Faculty, Institute or Name of the Company
- UNC Charlotte EPIC
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Abstract of the project</strong></td>
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<tr>
<td><strong>Tasks</strong></td>
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<td><strong>Requirements</strong></td>
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<td><strong>Language Skills</strong></td>
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<td><strong>Software Skills</strong></td>
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<td><strong>Other skills</strong></td>
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<td><strong>Minimum Duration of the project</strong></td>
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<td><strong>Type of research project</strong></td>
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<tr>
<td><strong>Responsible Professor</strong></td>
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<tr>
<td><strong>Supervisor/Mentor of the project</strong></td>
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<tr>
<td><strong>Supervisor`s Telephone Number</strong></td>
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<td><strong>Supervisor`s Email</strong></td>
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<td><strong>Faculty, Institute or Name of the Company</strong></td>
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## 10. ENERGY ANALYTICS AND FORECASTING

<table>
<thead>
<tr>
<th>Abstract of the project</th>
<th>Survey and archive energy forecasting papers in the literature; Analyze and archive energy data; Develop models and algorithms for energy forecasting (demand, price, and generation).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasks</td>
<td>8am - 5pm in office. Data analysis, modeling, academic reading, documentation, research and lab meetings.</td>
</tr>
<tr>
<td>Requirements</td>
<td>Industrial engineering; electrical engineering; operations research.</td>
</tr>
<tr>
<td>Language Skills</td>
<td>Fluency in English</td>
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<tr>
<td>Software Skills</td>
<td>SAS base programmer certification; regression analysis; time series analysis; strong statistics and economics background.</td>
</tr>
<tr>
<td>Other skills</td>
<td>SAS base programmer certification; regression analysis; time series analysis; strong statistics and economics background.</td>
</tr>
<tr>
<td>Minimum Duration of the project</td>
<td>up to six months</td>
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<td>Type of research project</td>
<td>Project in a research institute</td>
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<tr>
<td>Responsible Professor</td>
<td>Tao Hong</td>
</tr>
<tr>
<td>Supervisor/Mentor of the project</td>
<td>Tao Hong</td>
</tr>
<tr>
<td>Supervisor’s Telephone Number</td>
<td>704-687-1957</td>
</tr>
<tr>
<td>Supervisor’s Email</td>
<td><a href="mailto:thong@uncc.edu">thong@uncc.edu</a></td>
</tr>
<tr>
<td>Faculty, Institute or Name of the Company</td>
<td>UNC Charlotte EPIC</td>
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</table>


### Abstract of the project

The objective of this research is to investigate on contactless integrated current sensing techniques needed for next generation high frequency high voltage power electronic systems. This project will investigate on materials and implementation methods that are responding to the magnetic field produced by the carrying current in a printed circuit board trace. This research will address the challenges of measurements due to asymmetrical current distribution and significantly non-uniform magnetic field around the trace at frequencies beyond 1MHz. It is expected that the student develops a detailed simulation model for such solutions along with hardware prototypes to verify the proposed methods.

### Tasks

The students will be working closely with a PhD student on this project in EPIC Power Electronics Laboratory. He/She will be performing simulation study in the first phase of the project. Meanwhile, he/she is trained for the hardware experimentation. In the second phase of the project, the student demonstrates at least one method studied in the simulation on a hardware prototype and compares the results. He/She will be presenting once a week in the research group meetings and have the opportunity to exchange information among his/her peers.

### Requirements

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Engineering or Physics</td>
<td></td>
</tr>
<tr>
<td>Language Skills</td>
<td>Fluency in English</td>
</tr>
<tr>
<td>Software Skills</td>
<td>Familiarity of Multi-Physic simulation software such as Comsol, HFSS or similar is desirable</td>
</tr>
<tr>
<td>Other skills</td>
<td>Familiarity of Multi-Physic simulation software such as Comsol, HFSS or similar is desirable. Having background knowledge of hardware experimentations and basic power electronic circuits is essential.</td>
</tr>
</tbody>
</table>

### Minimum Duration of the project

up to six months

### Type of research project

Project in a research institute

### Responsible Professor

Babak Parkhideh

### Supervisor/Mentor of the project

Babak Parkhideh

### Supervisor’s Telephone Number

704-687-1959

### Supervisor’s Email

bparkhid@uncc.edu

### Faculty, Institute or Name of the Company

UNC Charlotte EPIC
# Design and Implementation of Control Algorithms to Integrate Solar PV with Energy Storage

## Abstract of the Project

The objective of this research is to develop and implement control algorithms to integrate solar PV with energy storage systems. In particular, the student will be working on the hardware setup developed at UNC Charlotte EPIC PV Integration Laboratory (PiL). The research will be on distributed control of energy source units while the output meets the grid requirements such as reactive power support and energy production ramp-rate.

## Tasks

The students will be working closely with a PhD student on this project in EPIC Power Electronics Laboratory and PV Integration Laboratory. He/She will be developing a hardware and firmware required to connect a power electronic system to different energy sources such as Solar PV panels and energy storage systems. In the course of this project, he/she is trained for the hardware experimentation. It is expected that the student demonstrates the interconnection of different sources by the end of the project. He/She will be presenting once a week in the research group meetings and have the opportunity to exchange information among his/her peers.

## Requirements

- Electrical Engineering
- Fluency in English

## Other Skills

- Having background knowledge of hardware experimentations and basic power electronic circuits is essential. Familiarity with digital control and firmware design using commercial microcontrollers is helpful.

## Minimum Duration of the Project

Up to six months

## Type of Research Project

Project in a research institute

## Responsible Professor

Babak Parkhideh

## Supervisor/Mentor of the Project

Babak Parkhidey

## Supervisor’s Telephone Number

704-687-1959

## Supervisor’s Email

bparkhid@uncc.edu

## Faculty, Institute or Name of the Company

UNC Charlotte - EPIC
# Abstract of the project

This project proposes to investigate and formulate the coupling of temperature-dependent transmission line models that are able to account for longitudinal non-uniformities in line parameters, with dynamic line rating techniques, leading to a novel methodology to estimate transmission network parameter and model structure of an electric power system. This would result in increased accuracy in estimates of network loading capabilities and system voltage stability indices. With the ever-increasing demand for electric power, in conjunction with the significant push for and subsequent increase in distributed generation connected to the existing network, transmission and distribution lines are now operating beyond their nominal ratings. This makes the grid increasingly vulnerable to service interruptions and blackouts. The lines represent, now more than ever, the primary limiting constraint to reliable and affordable delivery of electricity. Given practical limitations posed on infrastructure upgrading, the optimized use of the existing assets is of paramount importance. It is then essential to accurately determine network operating conditions, for both off-line and on-line applications allowing for optimized planning and operation of the system. By increasing the level of detail in the line model, and releasing select historical modeling assumptions, more accurate determination of the network operating conditions is expected.

The proposed research activities will provide a framework to study electric power systems by incorporating environmental conditions as new degrees of freedom in the line models. The focus will be on adaptive determination of transmission network model and of system transfer capability limits. The main research goals are to: 1. analytically investigate ambient condition-dependent power line models, including longitudinal non-uniformity in line parameters due to gradients in external conditions, 2. develop effective system applications tools, capitalizing on acquired theoretical knowledge, with special attention on estimation of line power handling capabilities, and 3. validate and evaluate the performance of resulting system models and application tools.

## Tasks

- Attend individual weekly research meetings with Dr. Cecchi (plus ad hoc meetings as needed)
  - Research discussion
  - Updates and plans
  - Be an active member of the Power Delivery Innovation research group
  - Interact with other students and researchers
  - Attend bi-weekly group meetings
  - Prepare weekly reports on research updates
  - To share with Dr. Cecchi during the scheduled weekly meetings
  - Setup and perform simulations as needed to complete research tasks
  - Setup and perform hardware emulation tests as needed to complete research tasks
  - Prepare presentation and present on research accomplishments (once or twice during the stay) at the research group meeting
  - Prepare, in collaboration with Dr. Cecchi and other researcher/s as relevant, conference and/or journal publication/s on research accomplishments

## Requirements

- Electrical Engineering knowledge
- Fluency in English
- n/a (Other skills)
- Up to six months (Minimum Duration of the project)
- Project in a research institute (Type of research project)
<table>
<thead>
<tr>
<th><strong>Responsible Professor</strong></th>
<th>Valentina Cecchi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supervisor/Mentor of the project</strong></td>
<td>Valentina Cecchi</td>
</tr>
<tr>
<td><strong>Supervisor`s Telephone Number</strong></td>
<td>704-687-8730</td>
</tr>
<tr>
<td><strong>Supervisor`s Email</strong></td>
<td><a href="mailto:vcecchi@uncc.edu">vcecchi@uncc.edu</a></td>
</tr>
<tr>
<td><strong>Faculty, Institute or Name of the Company</strong></td>
<td>UNC Charlotte EPIC</td>
</tr>
</tbody>
</table>
# Micro Grid Interconnected Power System Management with Energy Storage

## Abstract of the Project

In this work a micro grid interconnection system with energy storage device is studied. The main purpose of the study is to see the impact of reactive power and active power support of the grid with energy storage considering load and PV output forecasting. Further, the value proposition of the integrated energy storage system with the micro grid is evaluated to enhance the grid operational efficiency.

## Tasks

- Model the devices, analyze the grid model, develop models in real-time digital simulators, develop control architecture, design signal processing and control structures.

## Requirements

- Electrical Engineering (Power Systems)

## Language Skills

- Fluency in English

## Software Skills

- Dynamic modeling and analysis of power system, Control Systems, Data Analytics

## Minimum Duration of the Project

- Up to six months

## Type of Research Project

- Project in a research institute

## Responsible Professor

- Sukumar Kamalasadan

## Supervisor/Mentor of the Project

- Sukumar Kamalasadan

## Supervisor’s Telephone Number

- 704-687-7099

## Supervisor’s Email

- skamalas@uncc.edu

## Faculty, Institute or Name of the Company

- UNC Charlotte EPIC
## RESILIENT POWER SYSTEM WITH MICRO GRID BASED ON CONTROL FOR ENERGY STORAGE

### Abstract of the project

In this work an active and reactive power control methodology for energy storage to improve the voltage profile in a power distribution system is designed. The proposed methodology takes into consideration of the voltage profile in the distribution feeder and also the power variations at various points of the grid considering renewable energy resources. The overall objective is to develop a resilient power distribution feeder such that any changes due to internal or external disturbance is mitigated and a robust failsafe system is evolved.

### Tasks

- Model the devices, analyze the grid model, develop models in real-time digital simulators, develop control architecture, design signal processing and control structures.

### Requirements

- Electrical Engineering (Power Systems)

### Language Skills

- Fluency in English

### Software Skills

- Dynamic modeling and analysis of power system, Control Systems, Data Analytics

### Minimum Duration of the project

- up to six months

### Type of research project

- Project in a research institute

### Responsible Professor

- Sukumar Kamalasadan

### Supervisor/Mentor of the project

- Sukumar Kamalasadan

### Supervisor’s Telephone Number

- 704-687-7099

### Supervisor’s Email

- skamalas@uncc.edu

### Faculty, Institute or Name of the Company

- UNC Charlotte EPIC