



# Bharath

## INSTITUTE OF HIGHER EDUCATION AND RESEARCH

(Declared as Deemed-to-be University under section 3 of UGC Act, 1956)  
(Vide Notification No. F.9-5/2000 - U.3, Ministry of Human Resource Development, Govt. of India, dated 4<sup>th</sup> July 2002)



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Chennai - 600 073. Tamil Nadu.

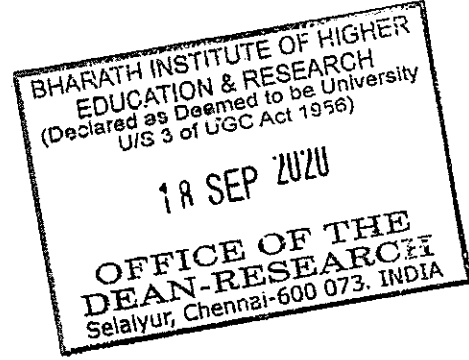
RefNo.SMS-2018-O-14

Date: 18/09/2020

TO

Mrs. Anitha Sampathkumar,  
Asst. Professor/EEE,  
BIHER.

Thro: Concern Head of the Department



Greetings!!!

We are happy to announce that the Research Advisory Committee has approved your proposal for Seed Money Scheme-2018 which was presented by you. You are requested to complete the proposal and send the progress report to the Dean Research in the prescribed time period.

**Title of the Project: Performance Evaluation of Isolated Micro-Grids with Hybrid Renewable Generation System**

**Seed Money Amount: Rs.1, 00,000/- (Rupees One Lakh Only)**

**Approved on: 10/03/2020**

**Payment details:**

**Cheque No.375350**

**Dated: 16/09/2020**

**Bank Name: Indian Bank, Selaiyur, Chennai.**

With Regards

Dean-Research

इंडियन बैंक  
Indian Bank

सेलैयूर ( तांबरम ) शाखा, चेन्नई - 600 073  
SELAIYUR (TAMBARAM) BRANCH, CHENNAI - 600 073  
IFS Code: IDIB000S246

"VALID FOR THREE MONTHS ONLY"

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Anirudh Sampathkumar

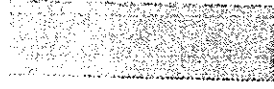
या धारक को OR BEARER

पच्चे One Lakh Only.

अदा करें

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HMCIA  
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For BIHER-RESEARCH AND CONSULTANCY

*[Signature]*  
Authorised Signatories  
Please sign above

⑈ 375350⑈ 600019250⑈

29

## PROPOSAL SUBMISSION

### 1. Details of Principal Investigator

**Name** : Ms. Anitha Sampathkumar  
**Designation** : Assistant Professor  
**Highest Qualifications** : M.E  
**Department** : Electrical and Electronics Engineering  
**E-mail** : anithas.eee@gmail.com  
**Contact no** : 9962700580  
**Date of Joining** : 12.08.2009

### 2. Details of Co - Principal Investigator

**Name** : Dr.S.Prakash  
**Designation** : Associate Professor  
**Highest Qualifications** : Ph.D.  
**Department** : Electrical and Electronics Engineering  
**E-mail** : prakashacademics@gmail.com  
**Contact no** : 9884032950  
**Date of Joining** : 10.05.2013

## Technical details

### 1. Introduction

- ▶ To reduce fossil energy consumption, the utilization of green energy sources has increasingly gained attention worldwide. In addition, the use of electric vehicles (EVs) is also effective in achieving this goal.
- ▶ Moreover, an EV can be regarded as a movable energy storage device. An experimental EV SRM drive is established. Its power circuit consists of a bidirectional dc/dc converter and an SRM various converters.
- ▶ The proper controls are made to possess good acceleration/deceleration, reversible driving, and regenerative braking characteristics. The SRM high-speed driving performance is further enhanced via commutation shift and voltage boosting.

### 2. Review of status of Research and Development in the subject

#### **RUI LI, FANGYUAN SHI, “Control and Optimization of Residential Photovoltaic Power Generation System with High Efficiency Isolated Bidirectional DC-DC Converter” IEEE Access 2019**

Currently, residential photovoltaic power generation system is increasingly used worldwide. In this paper, an optimized structure of residential photovoltaic (PV) power generation system with 1500V DC bus is proposed. It includes PV panels, a three-level boost converter, a high efficiency isolated bidirectional DC-DC converter, battery and three-phase five-level DC-AC converter that can work under islanding mode or grid-connected mode. The higher DC bus voltage greatly reduces line loss and improves efficiency of the system. An energy management scheme used for the system is proposed in this paper to guarantee the stability of the system and to increase its economic benefits. Besides, the optimized method for the structure of the bidirectional dc-dc converter is proposed. This structure can achieve higher DC voltage gain and higher efficiency. Furthermore, for low voltage battery application in the residential system, LLC and CLLC under DC transformer (DCX) mode are evaluated and the LLC is selected as the isolated bidirectional DC-DC converter. The optimized designed method of bidirectional LLC is proposed. Finally, experiments are carried out to verify the performance of the optimized converters and the system.

#### **HadiMoradisizkoochi, NourElsayad, Osama A. Mohammed, “Experimental Demonstration of a Modular, Quasi-Resonant Bidirectional DC/DC Converter Using GaN Switches for Electric Vehicles” IEEE Transactions on Industry Applications 2019**

A modular quasi-resonant bidirectional dc-dc converter composed of half-bridge gallium nitride modules (HBGM) with reduced switch voltage stress is proposed in this paper. By using an auxiliary capacitor, a resonant circuit is formed to shape the current and voltage so that zero-voltage switching at turn-on instant is achieved. Since the switching loss dominates the power losses in a high-frequency dc-dc converter, the soft-switching performance leads to a noticeable reduction in the total loss; so, the operating

temperature will decrease, and consequently, size of the heat sink will be reduced. The proposed circuit takes advantage of 4 enhancement-mode gallium nitride (eGaN) switches regarding their small on-resistance  $R_{DS(on)}$ , low gate charge, and fast switching speed to improve both efficiency and power density. The main performance issue of adopting GaN switches in a bidirectional dc-dc converter is the high voltage stress of GaN devices, which is handled by connecting the HBGM in the active-clamped stacked configuration, as well as optimizing printed circuit board layout design. Finally, a 1 kW, 600 V laboratory proto type operating at 100 kHz is implemented to validate the proposed concept.

**MAHMOUD M. SALIM, DESHENG WANG, YINGZHUANG LIU, HUSSEIN ABD EL ATTY ELSAYED, MOHAMED ABD ELAZIZ, "Optimal Resource and Power Allocation With Relay Selection for RF/RE Energy Harvesting Relay-Aided D2D Communication" IEEE Access 2019**

Device-to-device (D2D) communication is considered as a promising technology for improving both the spectral and energy efficiencies of cellular networks by reusing the resources of conventional cellular users (CUs) for direct communication of two nearby devices in a spatial manner. When the channel between the two D2D devices is highly attenuated, it is necessary to use an intermediate relay to achieve reliable and flexible relay aided D2D communication. In order to motivate the cooperative relays to participate, it is assumed that they can harvest energy from radio frequency (RF) signals based on the power splitting (PS) protocol as well as renewable energy (RE) sources. However, resource sharing between the cellular and relay-aided D2D links leads to mutual interference that degrades their sum rate. Considering the energy-harvesting relays (EHRs) and downlink (DL) resource sharing, this paper aims to maximize the sum rate of both the links without degrading the quality of service (QoS) requirements of all users. Our maximization problem is formulated as a mixed-integer nonlinear programming (MINLP) problem that cannot be solved in a straightforward manner. Therefore, we propose a low complexity algorithm, namely the resource and power allocation with relay selection EH-aided algorithm (RPRS-EH), which determines the reuse partners, the PS factor sub-optimal value with optimal links power allocation, and provide two different strategies for optimal relay selection. The numerical results show the behaviour of the proposed algorithm under various parameters as well as its considerable performance when compared to one of the most recent algorithms in terms of the links sum rate and relay energy efficiency.

**DONG QIN, YUHAO WANG, TIANQING ZHOU, "Optimal Relay Deployment in Bidirectional AF Relaying Systems" IEEE Access 2019**

Recently, the node deployment problem of a relay network has brought a hot discussion. This paper studies utility function minimum maximization problem of bidirectional amplify and forward relaying systems from the perspective of relay deployment. Since many optimization problems are considered separately, different algorithms are proposed for each optimization problem. So we consider a unified utility function instead of the separate optimization goals. Two different optimization problems are considered. One is to find the optimal relay deployment and optimize the utility function with fixed power allocation. The other is joint optimization of relay deployment

and power allocation. Especially when power is fixed, the relay deployment is not a fixed location, but a piecewise function. In order to balance the two opposite transmission directions in bidirectional relaying networks, the relay deployment is related to channel gain and path loss. In addition, approximate and accurate expressions of average relay deployment are investigated when only statistical channel information is available. Simulation results validate that the reasonable relay deployment improves the system performance.

**“Energy-Management System for a Hybrid Electric Vehicle, Using Ultra capacitors and Neural Networks” Jorge Moreno, Member, IEEE, Micah E. Ortúzar, Member, IEEE, and Juan W. Dixon, IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 53, NO. 2, APRIL 2006**

A very efficient energy-management system for hybrid electric vehicles (HEVs), using neural networks (NNs), was developed and tested. The system minimizes the energy requirement of the vehicle and can work with different primary power sources like fuel cells, micro turbines, zinc-air batteries, or other power supplies with a poor ability to recover energy from a regenerative braking, or with a scarce power capacity for a fast acceleration. The experimental HEV uses lead-acid batteries, an ultra capacitor (UCAP) bank, and a brushless dc motor with nominal power of 32 kW, and a peak power of 53 kW. The digital signal processor (DSP) control system measures and stores the following parameters: primary source voltage, car speed, instantaneous currents in both terminals (primary source and UCAP), and actual voltage of the UCAP. When UCAPs were installed on the vehicle, the increase in range was around 5.3% in city tests. However, when optimal control with NN was 6 used, this figure increased to 8.9%. The car used for this experiment is a Chevrolet light utility vehicle (LUV) truck, similar in shape and size to Chevrolet S-10, which was converted to an electric vehicle (EV) at the Universidad Católica de Chile. Numerous experimental tests under different conditions are compared and discussed.

**“Electric Vehicle Using a Combination of Ultra capacitors and ZEBRA Battery” Juan Dixon, Senior Member, IEEE, Ian Nakashima, Eduardo F. Arcos, and Micah Ortúzar; IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, VOL. 57, NO. 3, MARCH 2010**

The sodium–nickel chloride battery, commonly known as ZEBRA, has been used for an experimental electric vehicle (EV). These batteries are cheaper than Li-ion cells and have a comparable specific energy (in watt–hours per kilogram), but one important limitation is their poor specific power (in watts per kilogram). The main objective of this paper is to demonstrate experimentally that the combination of ZEBRA batteries and ultra capacitors (UCAPs) can solve the lack of specific power, allowing an excellent performance in both acceleration and regenerative braking in an EV. The UCAP system was connected to the ZEBRA battery and to the traction inverter through a buck–boost type dc–dc converter, which manages the energy flow with the help of DSP controllers. The vehicle uses a brushless dc motor with a nominal power of 32 kW and a peak power of 53 kW. The control system measures and stores the following parameters: battery voltage, car speed to adjust the energy stored in the UCAPs, instantaneous currents in both terminals (battery and UCAPs), and present voltage of the UCAP. The increase in

range with UCAPs results in more than 16% in city tests, where the application of this type of vehicle is being oriented. The results also show that this alternative is cheaper than Li-ion powered electric cars.

**“Energy Management and Control of Electric Vehicles, Using Hybrid Power Source in Regenerative Braking Operation” Bo Long, Shin Teak Lim, Zhi Feng Bai , JiHyoungryu and Kil To Chong ; Received: 27 April 2014; in revised form: 27 June 2014 / Accepted: 1 July 2014 / Published: 4 July 2014**

Today’s battery powered electric vehicles still face many issues: (1) Ways of improving the regenerative braking energy; (2) how to maximally extend the driving-range of electric vehicles (EVs) and prolong the service life of batteries; (3) how to satisfy the energy requirements of the EVs both in steady and dynamic state. The electrochemical double-layer capacitors, also called ultra-capacitors (UCs), have the merits of high energy density and instantaneous power output capability, and are usually combined with power battery packs to form a hybrid power supply system (HPSS). The power circuit topology of the HPSS has been illustrated in this paper. In the proposed HPSS, all the UCs are in series, which may cause an imbalanced voltage distribution of each unit, moreover, the energy allocation between the batteries and UCs should also be considered. An energy-management scheme to solve this problem has been presented. Moreover, due to the parameter variations caused by temperature changes and produced errors, the modelling procedure of the HPSS becomes very difficult, so an H $\infty$  current controller is presented. The proposed hybrid power source circuit is implemented on a laboratory hardware setup using a digital signal processor (DSP). Simulation and experimental results have been put forward to demonstrate the feasibility and validity of the approach.

**2.1 International Status: NIL**

**2.2 National Status: NIL**

**3. Progress/achievement so far,**

- a) Reference papers were collected.
- b) Literature survey was studied.
- c) Proposal work has been started in SRM BASED HYBRID ELECTRIC VEHICLE WITH BI- DIRECTIONAL NON-ISOLATED DC-DC CONVERTER

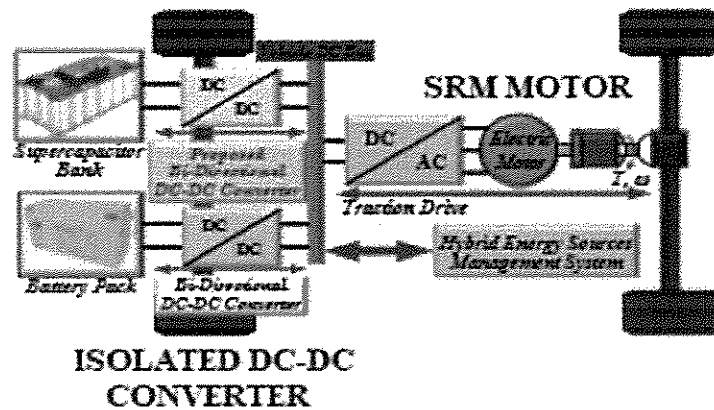
**4. Work Plan:**

**4.1 Methodology:**

- The main objectives of the operation of electric vehicle and charging / discharging depend upon the non isolated half bridge dc-dc converter. Battery supplies constant dc voltage to the voltage.
- The converters raise the input from the source. Such conversion initiates motion of switched reluctance motor.

- The converter act as buck converter at retardation time of switched reluctance motor and stores the charge excited at each phase.
- Variable dc bus connects the various output voltage from different source. Asymmetric bridge converter is chosen among various converters due to its reliability and fast dynamic response.

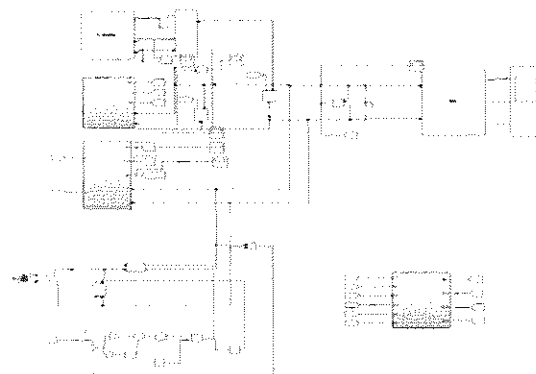
**Block Diagram:**



**SIMULATION BLOCK DIAGRAM**

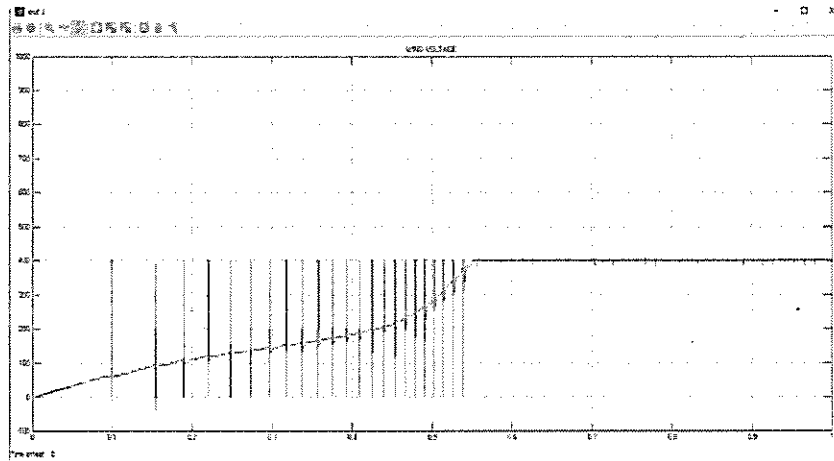
- Battery supplies constant dc voltage.
- Isolated dc-dc converter performs dc-dc conversion.
- Variable dc bus connects the various output voltage from different source.
- Asymmetric bridge converter converts dc voltage into ac and fed to SRM drive.

**Circuit diagram**

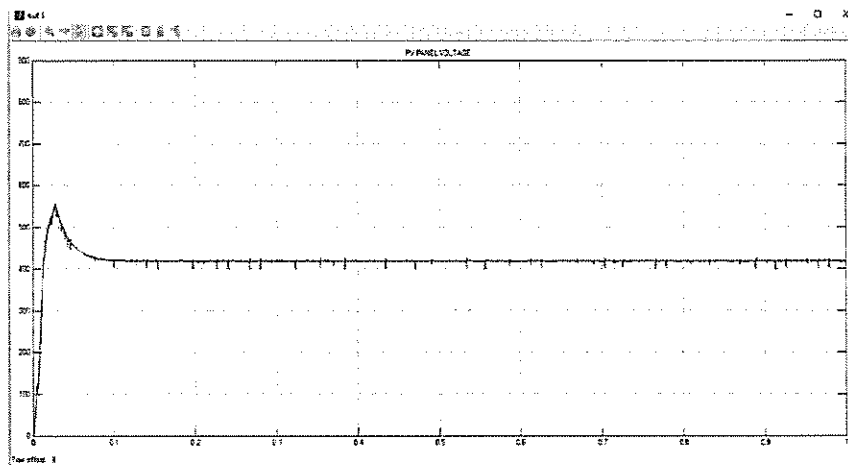


**SIMULATION CIRCUIT DIAGRAM**

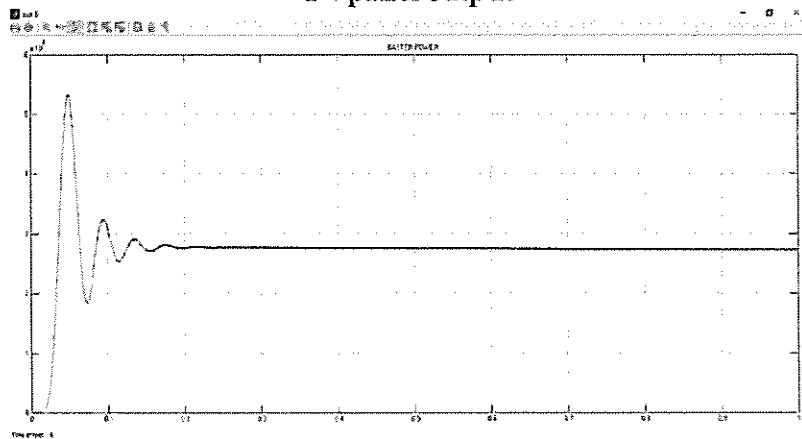
# INPUT & OUTPUT WAVEFORM



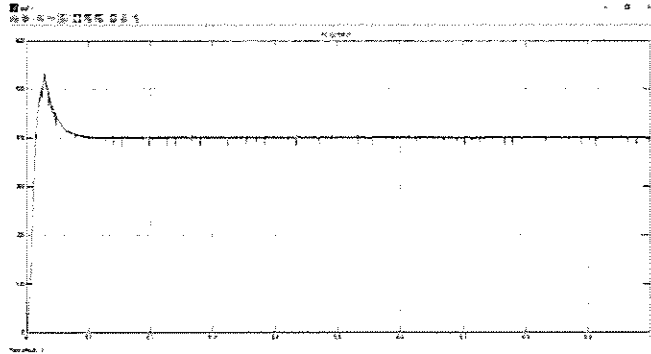
Wind voltage



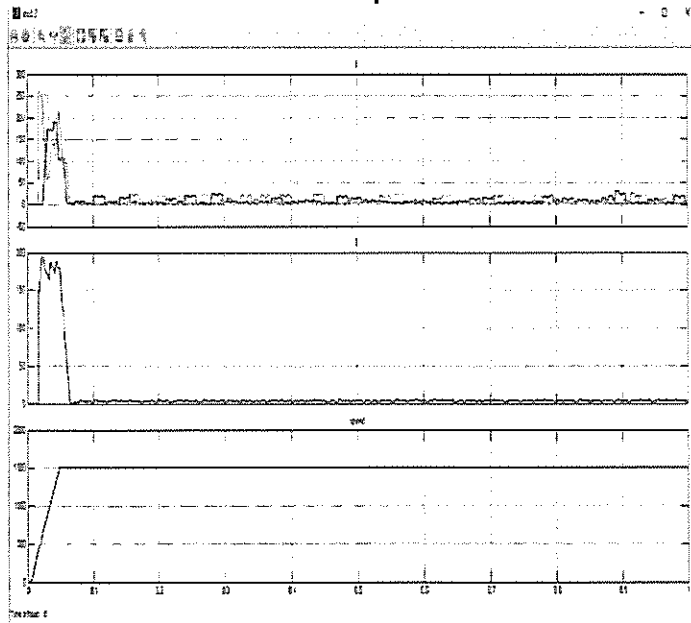
PV panel output



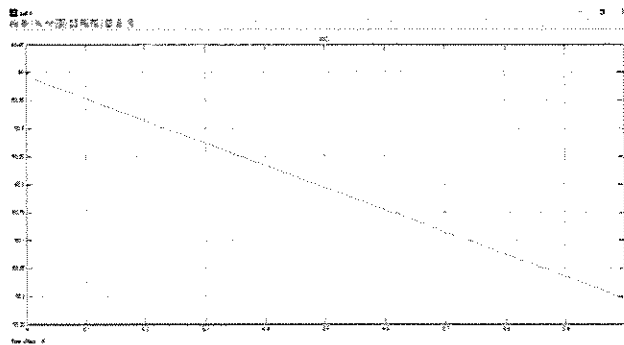
Battery output power



DC Output



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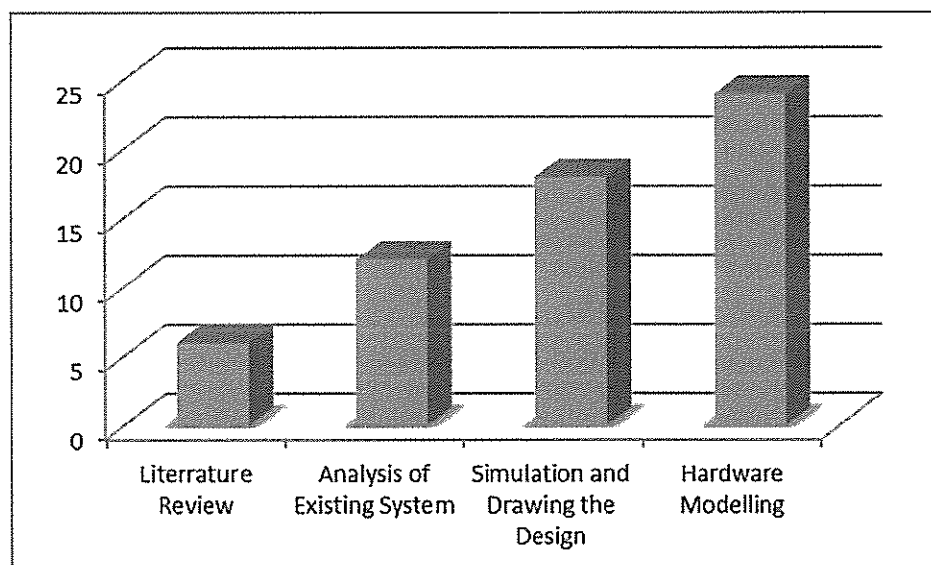


REPRESENTS SOC

#### 4.2 Time Schedule of activities giving milestones through BAR diagram.

Work plan (including detailed methodology and time schedule)

Sl. No.	Activity / Milestone	1 <sup>st</sup> Year		2 <sup>nd</sup> Year	
1.	Literature review	1-6			
2.	Analysis of existing system		7-12		
3.	Simulation and Drawing the design			13-18	
4.	Hardware modeling				19-24



#### 4.3 Expected outcome within the time period of Seed Money Scheme

- Prototype Hardware design can be implemented within the time period of Seed Money Scheme.
- For a real time HRES field work can be done within the time period of Seed Money Scheme.

5. Suggested Plan of action stating the name of funding agency where the project will be communicated for financial support within the time period of project.

Nil

6. Bibliography: Nil

7. List of Projects submitted/implemented by the Investigators (Separate for Pi and Co-PI)

Nil

7.1 Details of Projects submitted to various funding agencies:

Sl. No.	Title	Cost in lakhs	Month of submission	Role as PI/ Co-PI	Agency	Status
	NA	NA	NA	NA	NA	NA

7.2 Details of Projects under implementation

Sl. No.	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	NA	NA	NA	NA	NA

7.3 Details of Projects completed during the last 5 years

Sl. No.	Title	Cost in lakhs	Duration	Role as PI/ Co-PI	Agency
	NA	NA	NA	NA	NA

8. List of publications published by the Investigators, if any:

a) Co - Principal Investigator

S.NO	Authors	Title	Year	Source title	Volume	Issue
1.	Suresh, D.A., Ramesh, P., Prakash,	Controllers for handling three phase grid faults in voltage source converter based hvdc transmission	2020	International Journal of Advanced Science and Technology	29	5 Special Issue

	S., Dhanasek aran, R.	systems				
2.	Bhukya, S., Prakash, S.	Analysis of tie line connected hybrid power with brushless generators	2020	Journal of Advanced Research in Dynamical and Control Systems	12	2
3.	Pavan Kumar, K.V.N.S., Prakash, S.	Execution of BLDC motor using fuzzy logic controller on propulsion application for hybrid vehicle system	2019	International Journal of Recent Technology and Engineering	8	2 Special Issue 11
4.	Pavan Kumar, K.V.N.S., Prakash, S.	Modeling & design of a ANN controller for a BLDC motor on propulsion application for hybrid electric vehicle	2019	International Journal of Recent Technology and Engineering	8	2 Special Issue 11
5.	Bhukya, S., Prakash, S.	Enhance power quality of RES with employing smart loads	2019	International Journal of Innovative Technology and Exploring Engineering	8	11
6.	Prakash, S., Sakthivel, K., Anitha, S.	Microgrids connected to the residential grid for energy management utility fuzzy logic controller employed hybrid electric vehicles	2019	International Journal of Engineering and Advanced Technology	8	6 Special Issue 2
7.	Rangaswa my, T.R., Prakash, S., Rathika, R.	Intelligent excitation control system for plant generator	2019	International Journal of Engineering and Advanced Technology	8	6 Special Issue 2
8.	Jayalaksh mi, V., Rathika, R., Prakash, S.	A control scheme for current with cancellation of back EMF and tracing fault adapted commutation shift for SRM drive	2019	International Journal of Engineering and Advanced Technology	8	6 Special Issue 2
9.	Rangaswa	Advance control	2019	International	8	6 Special

	my, T.R., Prakash, S., Rathika, R.	scheme for desalination plant		Journal of Engineering and Advanced Technology		Issue 2
10.	Elayakumar, K., Dinesh, A., Manikandan, A., Palanivelu, M., Kavitha, G., Prakash, S., Thilak Kumar, R., Jaganathan, S.K., Baykal, A.	Structural, morphological, enhanced magnetic properties and antibacterial bio- medical activity of rare earth element (REE) cerium (Ce <sup>3+</sup> ) doped CoFe <sub>2</sub> O <sub>4</sub> nanoparticles	2019	Journal of Magnetism and Magnetic Materials	476	
11.	Viveka, K.P., Prakash, S.	Finite element analysis of current transformer in power system	2019	International Journal of Innovative Technology and Exploring Engineering	8	6
12	Velmurugan, T., Prakash, S.	Artificial intelligent based distribution automation of swift fault detection isolation and power restoration for HT network	2019	International Journal of Innovative Technology and Exploring Engineering	8	6
13	Jayavel, R., Rangaswamy, T.R., Prakash, S.	Efficient grid management system with renewable and conventional power sources	2019	International Journal of Innovative Technology and Exploring Engineering	8	6
14	Hemavathy, K., Sampthkumar, A., Prakash,	Closed loop control of dual buck-boost AC/DC converter for DC nano-grid using fuzzy-logic-controller	2019	International Journal of Innovative Technology and Exploring	8	6

	S.			Engineering		
15	Saravanan , C.R., Rathika, R., Prakash, S.	Effective energy audit and energy management of residential building	2019	International Journal of Recent Technology and Engineering	7	6
16	Sangeetha , G., Sherine, S., Arputharaj u, K., Prakash, S.	On Line Monitoring of Higher Rated Alternator using Automated Generator Capability Curve Administer	2019	Proceedings of the IEEE International Conference on &amp;amp;quot; &amp;amp;quot;; Recent Trends in Electrical, Control and Communication&a mp;amp;amp;quot; &amp;amp;quot;; RTECC 2018		
17	Bhukya, S., Prakash, S.	Effective power quality of grid connected WECS employing FLC controllers	2019	International Journal on Emerging Technologies	10	3
18	Sakthivel, K., Jayalaksh mi, V., Prakash, S.	Performance analysis of wind and photovoltaic system fed micro grid using fuzzy logic controller	2019	Journal of Advanced Research in Dynamical and Control Systems	11	1
19	Sherine, S., Prakash, S., Navaneeth amoorthy, A.	Investigation on solar panels with and without shading effects in series and parallel connections	2019	International Journal of Engineering and Advanced Technology	8	3
20	Prakash, S.	Enhancement in energy system stability with the utilization of facts devices	2017	International Journal of Mechanical Engineering and Technology	8	8

**b) Principal Investigator**

S.NO	Authors	Title	Year	Source title	Volume	Issue
1	Sampathkumar, A.	Guaranteed knowledge transmission for trade running Zigbee	2017	International Journal of Mechanical Engineering and Technology	8	8
2	Sampathkumar, A.	Three stage induction engine drive system utilizing converter SVPWM inverter fed from photovoltaic panel	2017	International Journal of Mechanical Engineering and Technology	8	8
3	Sampathkumar, A.	Breakdown of BLUE EYES tech	2017	International Journal of Mechanical Engineering and Technology	8	8
4	Sampathkumar, A.	Entry structure for a few queries in attribute founded encryption	2017	International Journal of Mechanical Engineering and Technology	8	8
5	Sampathkumar, A.	Smart vehicle guided for trains accident protection	2014	Middle - East Journal of Scientific Research	20	9
6	Sampathkumar, A.	Design and implementation of high performance stand alone photo voltaic generation system using MPPT system	2014	Middle - East Journal of Scientific Research	20	9

7	Sampathkumar, A.	Performance and analysis of SRM	2014	Middle - East Journal of Scientific Research	20	5
8	Sampathkumar, A.	Speed control of single phase induction motor using v/f technique	2013	Middle - East Journal of Scientific Research	16	12
9	Prathiba, Sampathkumar, A.	Speed control of linear induction motor	2015	International Journal of Applied Engineering Research	9	22
10	Ponmala, P., Sampathkumar, A.	Design improvement of multi-motor control based on CAN for industries	2014	International Journal of Applied Engineering Research	9	22
11	Prasad, K.S.S., Sampathkumar, A.	Solar and fuel cell dc application in phase shift flyback converters	2014	International Journal of Applied Engineering Research	9	22
12	Sampathkumar, A., Hemavathi, G., Dwarakesh, K.	Implementation of switched reluctance motor using PWM controlled split phase converter in hybrid	2019	International Journal of Engineering and advanced technology	8	6
13	Aarthi Suriya, S., Sampathkumar, A.r, Sherine, S	Implementation of interleaved three stage boost converter fed dc drive with zero-voltage transition	2019	International Journal of Engineering and advanced technology	8	6
14	Prakash, S., Sakthivel, K., Anitha, S.	Microgrids connected to the residential grid for energy management utility fuzzy logic	2019	International Journal of Engineering and advanced technology	8	6

		controller employed hybrid electric vehicles				
15	Sampathkumar, A., Aarthi Suriya, S., Sherine, S.	Analysis of the small signal stability of the power system connected with wind generators	2019	International Journal of Engineering and advanced technology	8	6
16	Rathika, R., Sakthivel, K., Anitha, S.	Examination of thermal and electrical performance of cassegrain concentrator system	2019	International Journal of Engineering and advanced technology	8	6
17	Suriya, A., Vijayaragavan, S.P., Anitha, S.	False load attack to smart meters by synchronously switching power circuits	2019	International Journal of Engineering and advanced technology	8	6
18	Sherine, S., Sakthivel, K., Anitha, S.	Implementation of p&o algorithm - MPPT technique for photovoltaic application	2019	International Journal of Engineering and advanced technology	8	6
19	Rathika, R., Sakthivel, K., Anitha, S.	Effective assessment of refractory period from ECG signal implemented using MATLAB	2019	International Journal of Engineering and advanced technology	8	6

## 9. Budget

Sl. No.	Equipment	Quantity	Amount in INR
1	Battery – 12V, 300AH	2	50,000
	Sine Wave Inverter – 1000Watts	1	15,000
2	Consumables (Like, testing tools Charge controller, etc.)	As per requirement	20,000
3	Travel support for the purpose of research work.	---	5,000
4	Contingency	---	5000
5	Others	---	5000
	<b>Total</b>		1,00,000

## 10. Name of at least two subject experts from the Institute and one from the outside Institute with their contact details:


- a) Dr.S.Prakash – Professor, Dept. of EEE, BIHER, Chennai-600073.
- b) Dr.S.Priya- Professor and HOD, Dept. of EEE, S.A.Engineering College, Chennai-600073.

## CERTIFICATE FROM THE INVESTIGATOR

Project Title: COMPARATIVE ANALYSIS OF DC CONVERTERS FOR ELECTRICAL HYBRID VEHICLE USING RELUCTANCE MACHINE

It is certified that

1. I do hereby agree to submit a complete proposal for financial support to the external funding agency within the time period of SMS-2018
2. I undertake that spare time on equipment procured in the project will be made available to other users.
3. I agree to submit a certificate from Institutional Biosafety Committee, if the project involves the utilization of genetically engineered organisms. I also declare that while conducting experiments, the Biosafety Guidelines of Department of Biotechnology, Department of Health Research, GOI would be followed in to.
4. I agree to submit ethical clearance certificate from the concerned ethical committee, if the project involves field trails/experiments/exchange of specimens, human & animal materials etc.
5. I agree to abide by the terms and conditions of SMS-2018, BIHER, and Chennai.

  
Name and signature of  
Principal Investigator

  
Name and signature of  
Co-Principal Investigator

Date: 20.2.2020

Place: Chennai - 73

  
Forwarded by Head of the Department

  
Signature of the Head

## PROJECT EVALUATION FORMAT

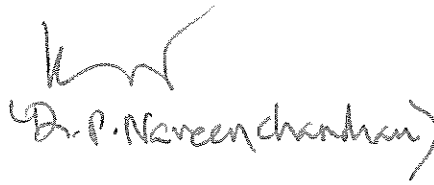
### Recommendation Sheet

Name of the Principal Investigator	Ms.Anitha Sampathkumar
Name of the Co-Investigator	Dr.S.Prakash
Name of the Department	EEE
Title of project	Comparative Analysis Of Converter Topologies For Electric Hybrid Vehicles Using Reluctance Machines
Recommendation of the evaluation committee	Yes.
Financial allocation recommended	Rs. 1,00,000/-

Sl. No.	Equipment	Quantity	Amount in INR
1	Battery – 12V, 300AH	2	50,000
	Sine Wave Inverter – 1000Watts	1	15,000
2	Consumables (Like, testing tools Charge controller, etc.)	As per requirement	20,000
3	Travel support for the purpose of research work.	---	5,000
4	Contingency	---	5000
5	Others	---	5000
	<b>Total</b>		<b>1,00,000</b>

Name and Signature of the Research Advisory Committee members with date

Recommended

  
Dr. P. Naveen Chandan

