**PUDUCHERRY TECHNOLOGICAL UNIVERSITY,**

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING.**

**BATCH(2017-2021)**

**TITLE OF THE PROJECT:**

**STABILITY AND STABILIZATION OF NETWORKED LOAD FREQUENCY CONTROL SYSTEMS INTEGRATED WITH ELECTRIC VEHICLE (EV) AGGREGATORS.**

**PROJECT GUIDE**: **Dr. K. RAMAKRISHNAN, ASSOCIATE PROFESSOR (EEE),**

**PUDUCHERRY TECHNOLOGICAL UNIVERSITY**.

**BATCH LIST:**

|  |  |  |
| --- | --- | --- |
| **SL.NO.** | **REG.NO** | **NAMES** |
| **1** | **17CE153** | **SHARINI RITHIGAA B S** |
| **2** | **17EE111** | **GOKULNATH M** |
| **3** | **17EE118** | **KALAVAGUNTA VAMSHI** |
| **4** | **17EE119** | **KALLA ANIL SAI KUMAR** |

**ABSTRACT**:

In this project, stability analysis and stabilization of a single-area load frequency control system integrated with electric vehicle aggregator over a communication network will be investigated. The use of open communication channel in the closed loop control of load frequency systems integrated with Electric Vehicle Aggregator introduces time-delays in feedback loop. The presence of time delay in feedback loop of the closed loop load frequency control system affects performance and stability of the system. If the delays induced by the communication network go beyond a critical margin, the closed loop system loses stability. Therefore a graphical method of characterizing stability boundary locus is implemented. For a given time delay, the method computes all the stabilizing gains of PI controller, which constitutes a stability regions in parameters of space of PI controller. Later, in order to complement the stability regions, a frequency domain exact method is used to calculate stability delay margins for various values of PI controller gains. The complete analysis is made in order to pass the information of error in the system within the stability margin delay to bring the system to equilibrium point. The impact of EV aggregator on both the stability regions and stability delay margins is thoroughly analyzed and the results are validated by time-domain simulations.

**REFERENCES:**

1. Ausnain Naveed, Sahin Sonmez and Saffet Ayasun, ‘Impact of Electric Vehicle Aggregator with Communication Time Delay on Stability Regions and Stability Delay Margins in Load Frequency Control System,’ *Journal of Modern Power Systems and Clean Energy*, In Press. DOI: 10.35833/MPCE.2019.000244, 2020, Springer. (**BASE PAPER**)
2. Hakan Gunduz, Sahin Sonmez and Saffet Ayasun, ‘Impact of Electric Vehicles Aggregator on the Stability Region Micro-Grid System with Communication Time Delay,’ 2019 IEEE Milan Power Tech.
3. Vijay P. Singh, Nand Kishor, and Paulson Samuel, ‘Communication Time Delay Estimation for Load Frequency Control in Two Area Power Systems,’ *Ad Hoc Networks*, Vol. 41, No. 1, pp. 69-85, May 2016.
4. Ausnain Naveed, Sahin Sonmez and Saffet Ayasun, ‘Stability Regions in the Parameter Space for LFC System with EV Aggregator and Incommensurate Time Delays,’ 1st IEEE Global Power Energy and Communication Conference (GPECOM 2019), June 12-15, 2019, Cappadocia, Turkey.
5. Han, Y., Zhang, K., Hong, L., Coelho, E. A. A., and Guerrero, J. M, ‘MAS-based Distributed Coordinated Control and Optimization in Microgrid and Microgrid Clusters: A Comprehensive Overview.’ *IEEE Transactions on Power Electronics*, Vol. 33, No. 8, pp. 6488-6508, 2018.
6. H. Luo, I. A. Hiskens and Z. Hu, ‘Stability Analysis of Load Frequency Control Systems With Sampling and Transmission Delay,’ IEEE Transactions on Power Systems, Vol. 35, No. 5, pp. 3603-3615, Sept. 2020
7. K. S. Ko and D. K. Sung, ‘The Effect of EV Aggregators With Time-Varying Delays on the Stability of a Load Frequency Control System,’ IEEE Transactions on Power Systems, Vol. 33, No. 1, pp. 669-680, Jan. 2018
8. Deniz Katipoglu, Sahin Sonmez and Saffet Ayasun, ‘Stability Delay Margin Computation of Load Frequency Control System with Demand Response,’ 1st IEEE Global Power Energy and Communication Conference (GPECOM 2019), June 12-15, 2019, Cappadocia, Turkey.

**TIME LINE:**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **PERIOD** | **WORK DONE** |
| **1** | **PHASE 1:**  REVIEW 0 | LITERATURE SURVEY |
| **2** | REVIEW 1 | DELAY DEPENDENT STABILITY ANALYSIS |
| **3** | REVIEW 2 | SIMULATION RESULTS OF STABILITY ANALYSIS |
| **4** | **PHASE 2:**  REVIEW 1 | COMPUTATION OF STABILITY REGIONS |
| **5** | REVIEW 2 | SIMULATION RESULTS OF STABILITY REGIONS |
| **6** | FINAL REVIEW | THESIS |