Electric Spring for Power Factor Correction using Fuzzy Logic Controller

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Abstract- Electric spring (ES), another brilliant network innovation, has prior been utilized for giving voltage and power stability in a pitifully managed/independent sustainable power source powered matrix. Electric spring alongside noncritical burdens can frame brilliant burden which can be utilized to control the voltage at the purpose of conveyance framework where it is associated. The utilization of 'Electric Springs' is a novel method for circulated voltage control while at the same time accomplishing powerful interest side administration through regulation of noncritical loads because of the variances in discontinuous sustainable power sources (for example wind). Be that as it may, to demonstrate the adequacy of such electric springs when introduced in huge numbers over the power framework, there is a need to create straightforward but then precise recreation models for these electric springs which can be fused in huge scale power framework reenactment contemplates. Here, the control of electric spring is modified using fuzzy logic controller to improve the power factor ad power stability in the circuit.

Keywords- Fuzzy, Electric Spring, Controller

I. INTRODUCTION

Electric spring (ES), another keen network innovation, has prior been utilized for giving voltage and power stability in a feebly controlled/independent sustainable power source powered matrix. [1][2] Electric spring alongside noncritical burdens can shape savvy load which can be utilized to control the voltage at the purpose of dissemination framework where it is associated.[3] The utilization of 'Electric Springs' is a novel method for circulated voltage control while all the while achieving successful demand-side management through regulation of noncritical loads because of the changes in discontinuous sustainable power sources (for example wind). [4][5] Be that as it may, to demonstrate the viability of such electric springs when introduced in enormous numbers across the power framework, there is a need to create straightforward but then accurate reenactment models for these electric springs which can be fused in huge scale power framework reproduction examines. [6][7]

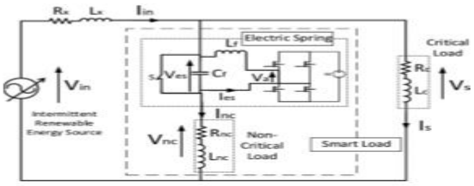

Fig.1: ES in A Circuit

Likewise, a similar investigation of this scheme versus the customary control scheme of ES is additionally done and exhibited the characteristics of a regular and extemporized ES are outlined. Additionally, single-stage to d-q change is talked about. [8][9] The displaying of ES and the extemporized control scheme are clarified in this paper, throughreenactment ponder first the presentation of the ordinary ES is talked about. The control schemes are connected to a similar framework are introduced. Likewise, a similar examination is performed between the two control schemes, i.e., the regular info voltage control and input-voltage-input-current control scheme. [10]

II. IMPLEMENTATIONS

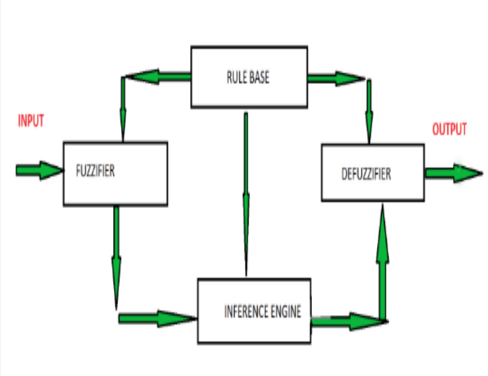

Fig.2: Fuzzy Logic Architecture

Its Architecture contains four sections:

- RULE BASE: It contains the aet of principles and the IF-THEN conditions given by the specialists to oversee the basic leadership framework, based on semantic data. Late advancements in fuzzy hypothesis offer a few powerful techniques for the structure and tuning of fuzzy controllers. The greater part of these advancements lessen the quantity of fuzzy guidelines.

- FUZZIFICATION: It is utilized to change over data sources for example fresh numbers into fuzzy sets. Fresh sources of info are essentially the exact data sources estimated by sensors and go into the control framework for preparing, for example, temperature, weight, rpm's, and so forth.

- INFERENCE ENGINE: It decides the coordinating level of the current fuzzy contribution concerning each standard and chooses which guidelines are to be terminated according to the info field. Next, the terminated standards are consolidated to frame the control actions.

- DEFUZZIFICATION: It is utilized to change over the fuzzy sets acquired by deduction motor into a fresh esteem. There are a few defuzzification techniques accessible and the most appropriate one is utilized with a particular master framework to lessen the harmonics.

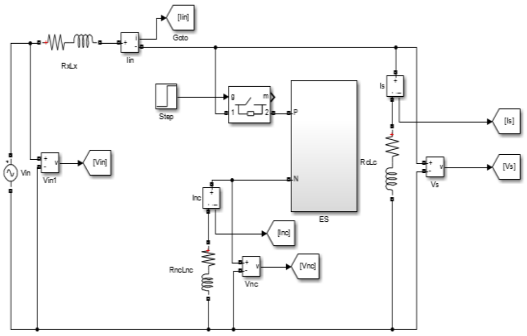

Fig.3: Electric spring model

The above figure shows the electrical spring model. The electric spring is a smart grid technology, it provides voltage and power regulation.

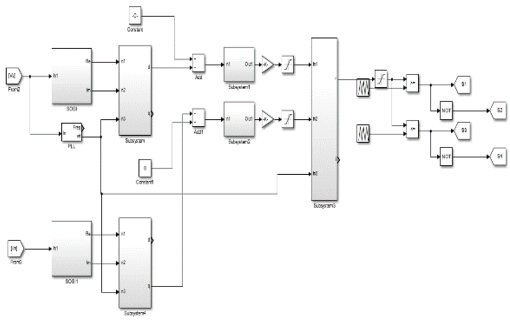

Fig.4: Control system based on PI control

In figure 4 shows the Control system based on PI control we are using proportional integral controlling system is used in this control system.

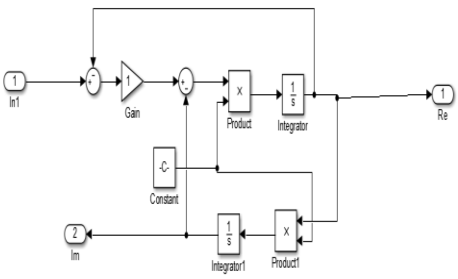

Fig.5: PI control system

In this figure is PI control system, the advantage of this PI system Zero steady state error, Stability and Maximum peak overshoot.

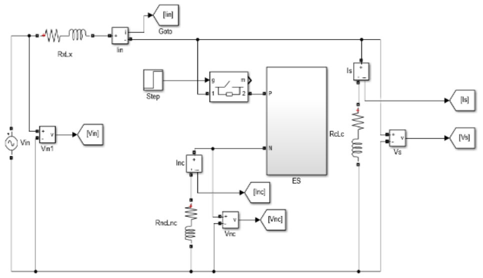

Fig.6: Proposed model on fuzzy logic

Figure 6 shows the proposed model on fuzzy logic, this our proposed system using fuzzy logic and here we are getting corrected voltage and current output.

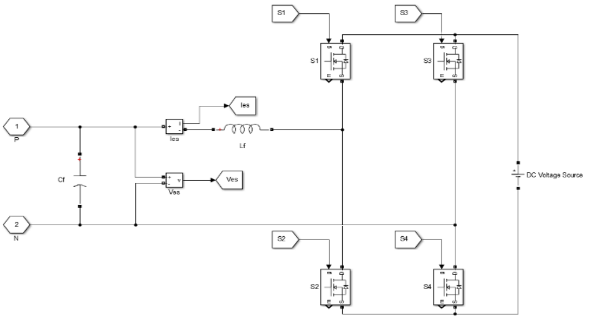

Fig.7: Proposed control system using fuzzy logic

The above figure shows the Proposed control system using fuzzy logic, here we are using the fuzzy logic because we want to get out put in high efficiency.

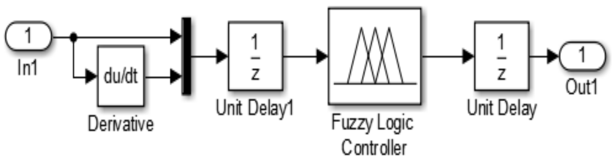

Fig.8: Fuzzy logic Controller

The figure shows the fuzzy logic controller. A fuzzy control system is a control system based on fuzzy logic.

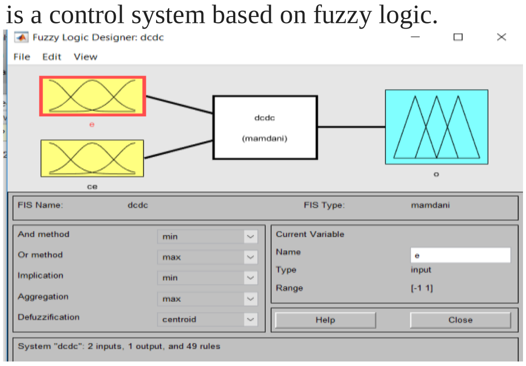

Fig.9: Fuzzy file DC

The figure 9 shows the Fuzzy file DC.

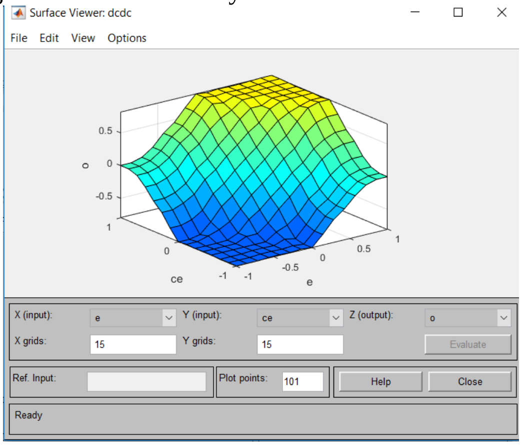

Fig.10: Surface view of defined rules in fuzzy logic controller

The above figure shows the Surface view of defined rules in fuzzy logic controller.

III. RESULTS

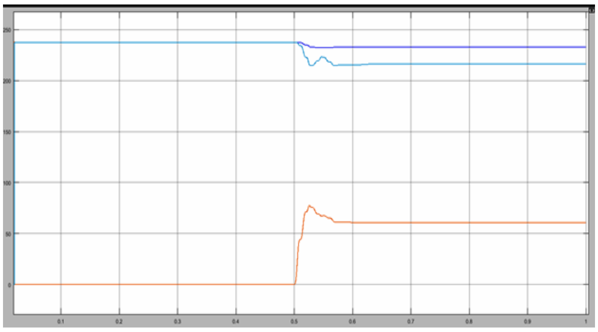

Fig.11: Over voltage: conventional (rms voltage) proposed system

The figure shows the Over voltage: conventional (rms voltage) proposed system, here we can see rms voltage in proposed system

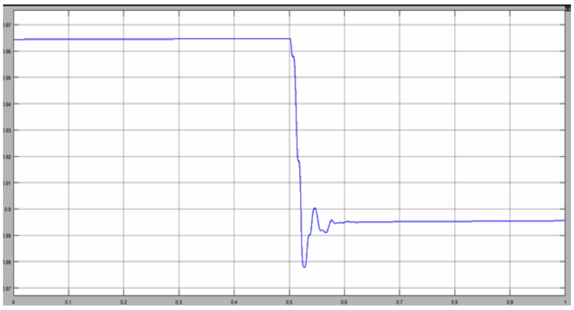

Fig.12: Over voltage: conventional (pf) of proposed system

In above figure shows the waveform of Over voltage: conventional (pf) of proposed system, here we can see the power factor of the system.

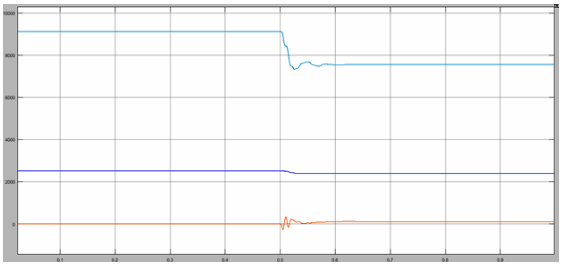

Fig.13: Active powers of proposed system

The above figure shows the Active powers of proposed system, here we can see the active power of the system using fuzzy logic.

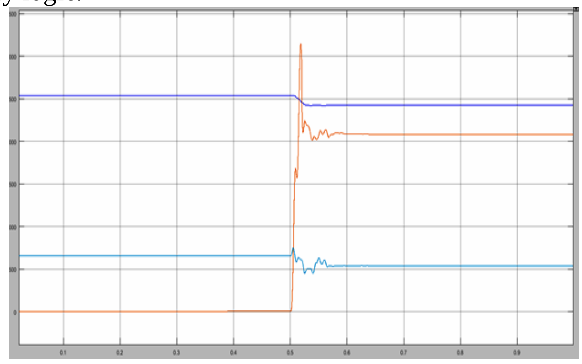

Fig.14: Reactive power of proposed system

The above figure shows the reactive power of proposed system in Overvoltage, conventional ES, here shows the reactive power across critical load, noncritical load, and ES.

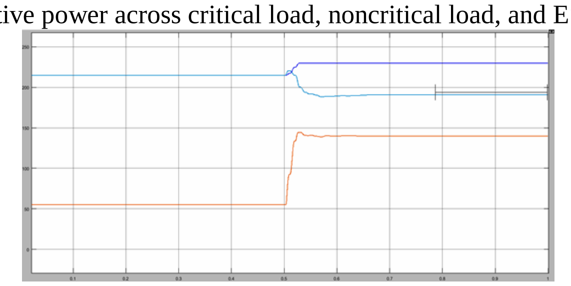

Fig.15: Undervoltage: Conventional ES, RMS voltage proposed system

The figure shows the rms voltage of the system, here we can see the waveform of the electrical spring, line voltage and non-critical voltage.

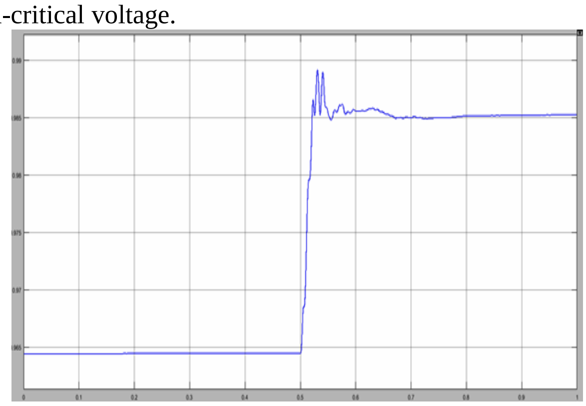

Fig.16: Undervoltage, conventional ES: Power factor of proposed system

The figure shows the Undervoltage, conventional ES: Power factor of proposed system, here the power factor giving some variation.

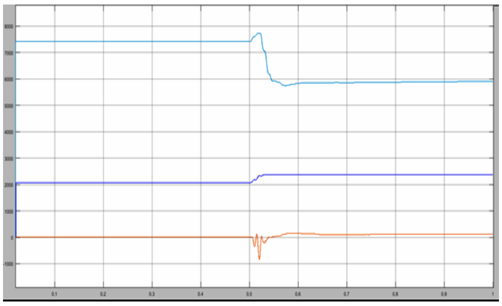

Fig.17: Active power of proposed system

The above figure shows the active power of proposed system, here we can see the three waveform that is across critical load, noncritical load, and ES.

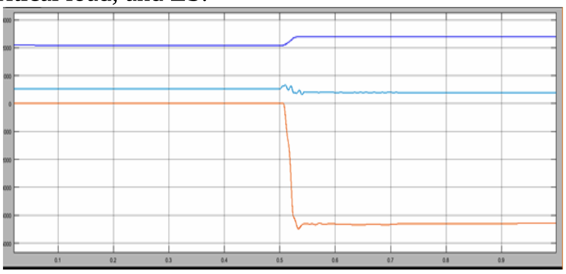

Fig.8: Reactive power of proposed system

The figure shows the reactive power proposed sytem across critical load, noncritical load, and ES.

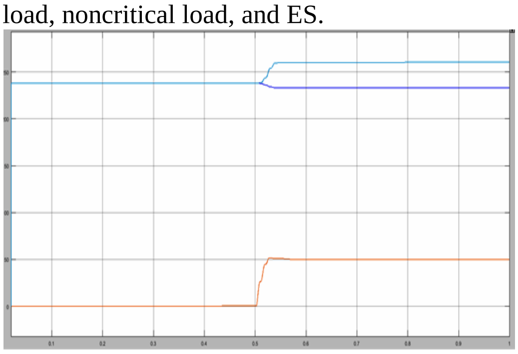

Fig.19: Rms voltage

The figure 19 shows the rms value of the system, here we can see ES voltage, and noncritical load voltage.

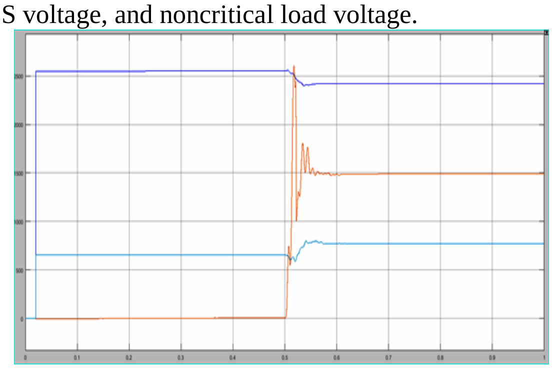

Fig.20: overvoltage, conventional ES: Reactive power of proposed system

The figure shows the overvoltage, conventional ES: Reactive power of proposed system, here the waveform shows the reactive power.

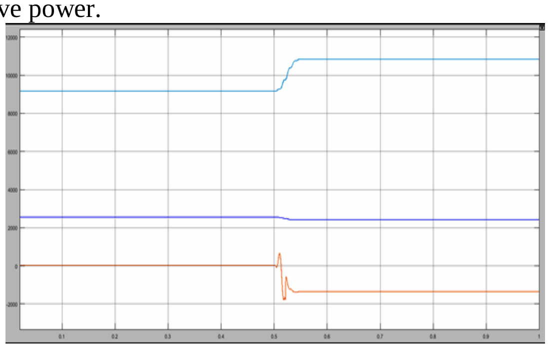

Fig.21: RMS voltage of proposed system

The figure 21 shows the RMS voltage of proposed system, here we are using the fuzzy logic to improving rms voltage value.

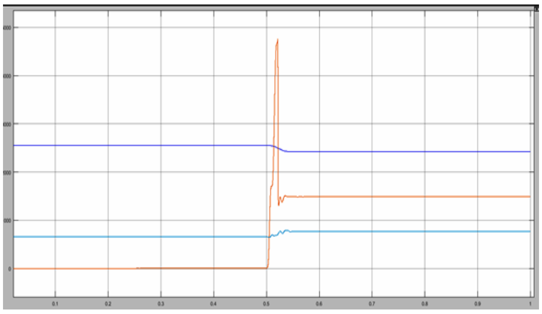

Fig.22: fuzzy based active power of proposed sytem

The figure shows the fuzzy based active power of proposed sytem, for we are improving the result by using the fuzzy logic.

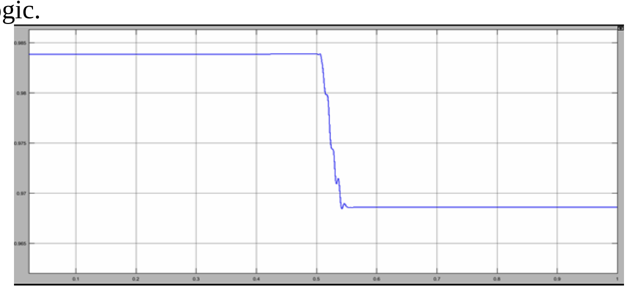

Fig.23: fuzzy logic based improved overvoltage, power factor

The figure 23 shows the fuzzy logic based improved overvoltage, power factor.

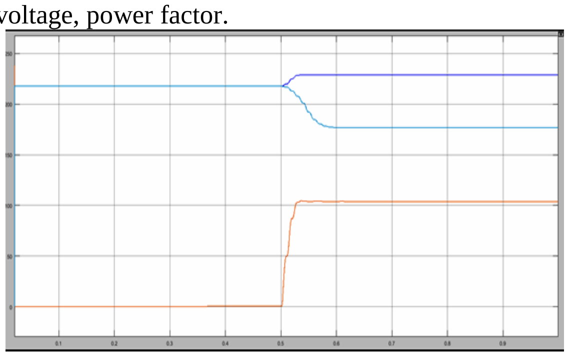

Fig.24: fuzzy logic based improved overvoltage, rms voltage

The figure 24 shows the fuzzy logic based improved overvoltage, rms voltage, here we are using the fuzzy logic to improving the result.

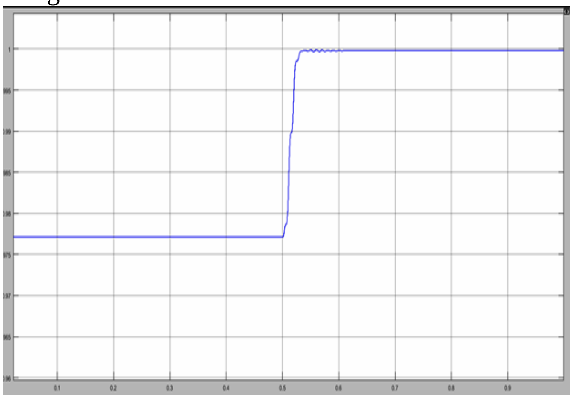

Fig.25: fuzzy logic-based power factor

The figure shows the fuzzy logic-based power factor, here we are using fuzzy logic so power factor is corrected here it become one.

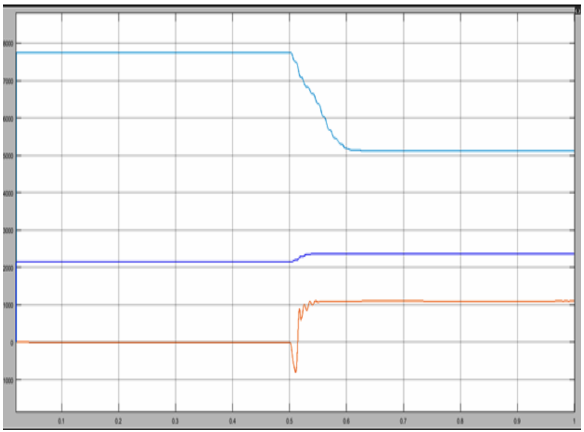

Fig.26: Improved active power using fuzzy logic of proposed system

The figure 26 shows the Improved active power using fuzzy logic of proposed system

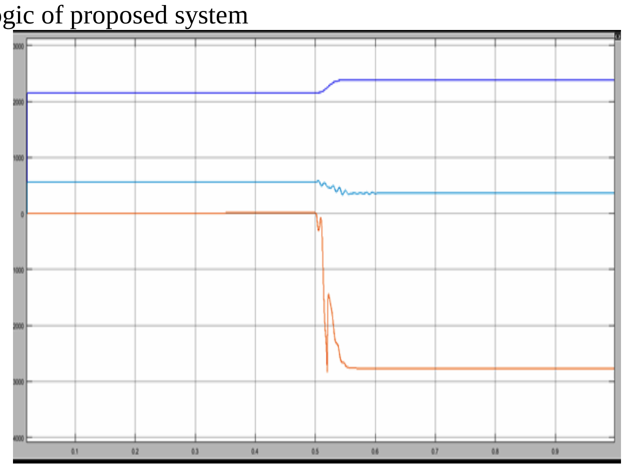

Fig.27: fuzzy logic Using improved es under voltage of proposed sytem

The above figure shows the fuzzy logic Using improved es under voltage of proposed sytem,

IV. CONCLUSION

Hence we are studied and implement in simulink Electric Spring for Voltage and Power Stability and Power Factor Correction, here we are doing the power factor correction using fuzzy logic. The electric spring is another innovation that has attractive highlights including dynamic voltage guideline, adjusting power free market activity, power quality improvement, conveyed power remuneration and diminishing energy stockpiling prerequisites for future keen matrix. The utilization of 'Electric Springs' is a novel method for circulated voltage control while all the while achieving compelling demand-side management through tweak of non-basic loads in light of the vacillations in irregular sustainable power sources.

V. REFERENCES

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