Chicken Swarm Optimization based PV-STATCOM for Power Compensation in Hybrid PV/WT System

K. Sudarsan[a], and G. Sreenivasan[b]

[a]Department of EEE, Research scholar, JNTUA University, Anantapuramu,
[b]Department of EEE, Professor, Srinivasa Ramanujan Institute of Technology, Anantapuramu.

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Abstract: Today's the Energy changes like air contamination and a dangerous atmospheric deviation are increases. To direct these troubles the sustainable power sources are presented. PV ranch generate power throughout daytime and totally latent for the period of nighttime. During daytime the inverter is used for authentic power creation and for the period of night-time it is used to satisfy the need. For the examination of PV-STATCOM it is anticipated with calculation, such as The CSO calculation is utilized to accomplish the organize of parameters like Voltage, current, and Powers. The Control Strategies are endorsed through MATLAB/Simulink Platform So as to assess the convenience of the projected strategy, this is contrasted with the possible technique like PSO method.

Keywords: PV-STATCOM, PSO (Particle Swarm Optimization), CSO (Chicken Swarm Optimization)
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1. Introduction

Energy is the key aspect for urbanization, monetary new development and enhancement of individual fulfillment (Hosseini, 2020). To sidestep the SSR in control structures, the employ of FACTS plans has been envisioned (Jiang, 2019; Ranjeeth, 2020) The sturdiness of the SSSC and its regulator is affirmed in this paper by oppressing an un symmetrical fault. The evaluation of the belongings of SSSC type regulator is verified when it is presented to an symmetrical fault on transmission line (Kanaga, 2021). A partial request corresponding regulator type UPFC is examined to moist out sub concurrent movements in generator shaft owing to SSR (Murugan, 2020; Rahim, 2020; Ranjeeth, 2019).

Introduces a new energy control for a grid related inverter. The examinations are observed for the collections of SMIB structures (Zhang, 2020; Singh, 2019; Aroulanandam, V. V.,2019).

Consequently the RSC controlers of DFIG were utilized (Chikohora, 2020; Sekaran, 2020;Shankar, 2020). For the evaluating the introduction of controllers in damping SSR, a period repeat assessment is used (Sampath Kumar, 2020; Latchoumi, 2017;Rajan, 2020). A WAMS based normal regulator is used to in PV plant to wet the SSR (Irsalinda, 2017).

2. PV-STATCOM based control configuration

In daytime the PV framework and wind framework is producing power for culmination the load. The night time, the wind and STATCOM full fills the need in light of the fact that in the night time the PV close planetary structure is missing (Fardad, 2019; Latchoumi, 2013; Aleem, 2020). The anticipated development is outlined in the Fig 1. The PV and Wind is joined for generating capacity to the load request. The capacitors are shown in fig 1 utilized for delicate exchanging and diminish voltage spikes.
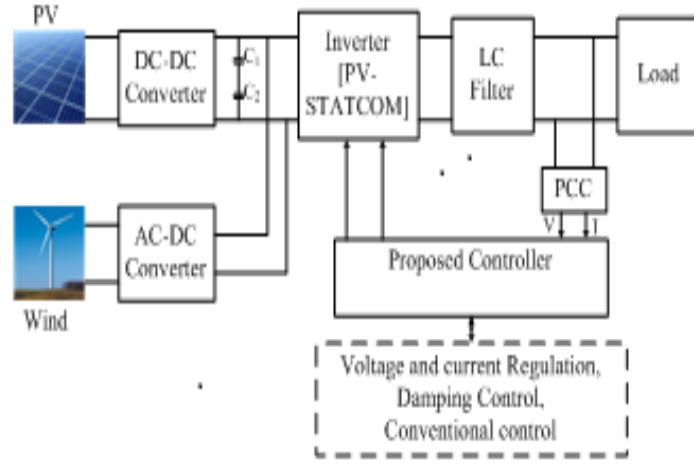
Figure. 1: Block diagram for projected method

2.1. CSO algorithm

The CSO calculation is used to limit the error standards of the parameters. The CSO calculation, the best wellness esteem is allocated to rooster cloud and the most exceedingly awful wellness esteem is allocated to chick cloud. The remainder of the qualities are allocated to hen cloud (Dug, 2019).

Step 1: Initialise the population, errors and change in errors of the parameters

$$x_{i,j}^{t+1} = lrb + Rand(urb - lrb) \tag{1}$$

Step 2: calculate the robustness and initialise the best personal position

$$F = Minimum \ (E_v, \ E_I, \ E_P, \ E_Q) \tag{2}$$

Step 3: Grade the strength of the chicken and determine the relation.

$$x_{i,j}^{t+1} = x_{i,j}^{t} + S1 * Rand * \left(x_{r1,j}^{t} - x_{i,j}^{t}\right) + S2 * Rand * \left(x_{r2,j}^{t} - x_{i,j}^{t}\right) \tag{3}$$

Step 4: Modernize the position of the Roosters, the hen and the chick.

$$x_{i,j}^{t+1} = x_{i,j}^{t} * (1 + Rand(0, \sigma^2)) \tag{4}$$

$$\sigma^2 = \begin{cases} 1, & if \ f_i \leq f_k \\ \exp\left(\dfrac{f_k - f_i}{|f_i| + \varepsilon}\right) & otherwise \ k \in [1, N], k \neq 1 \end{cases} \tag{5}$$

Step 5: modernize the best personal position N_{best}

Step 6: At $t = t + 1$, if the stop situation is meet, output is most favorable; or else, go to step 3.

3. Results and Discussions

In this segment, the presentation of the projected regulator is explored in Fig.2. The projected framework is utilized to control the parameters and improve the power for the period of PV-STATCOM.
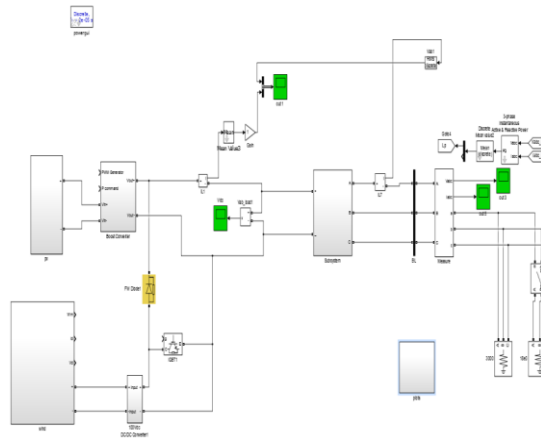
Figure 2: Simulation model of projected method

The projected regulator of CSO calculation is utilized to improve the STATCOM arrangement. The assessment of the execution consequences are watched.

3.1. Performance Analysis

The recreated consequence of the projected regulator is analyzed in particular cases. The cases are,

Case 1: PV STATCOM operation during day time

The presentation of PV STATCOM by means of CSO and PSO calculations are analysed openly subject to the simulation results during daytime and nighttime. For this circumstance, the daytime the PV power is dynamic owing to the irradiance stage is high. The daytime the total power is remunerated the load demand thought to be predictable of 8000W. The Load power is outlined in the Fig. 3. For the period of daytime, the generated powers are compensated the load demand appeared in Fig. 4 and 5.
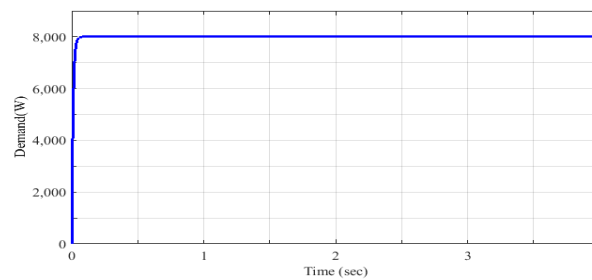

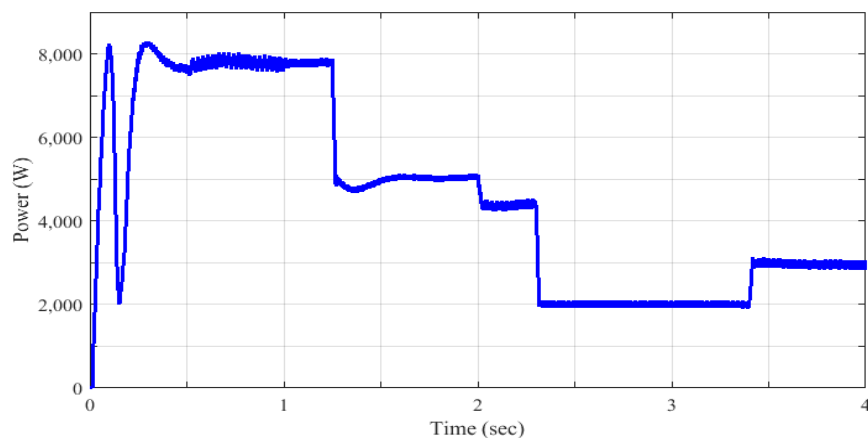**Figure 3:** Analysis of load demand power

Figure 4: PV solar generated power

Fig. 6(a) shows the Generated Power with load demand. The reference power is 8000W. Using the projected calculation, the load request is meet by the Generated powers. So additionally, the load is changed subsequent to the exacting time second, and subsequently anticipated the powers showed up in Fig. 6(b)
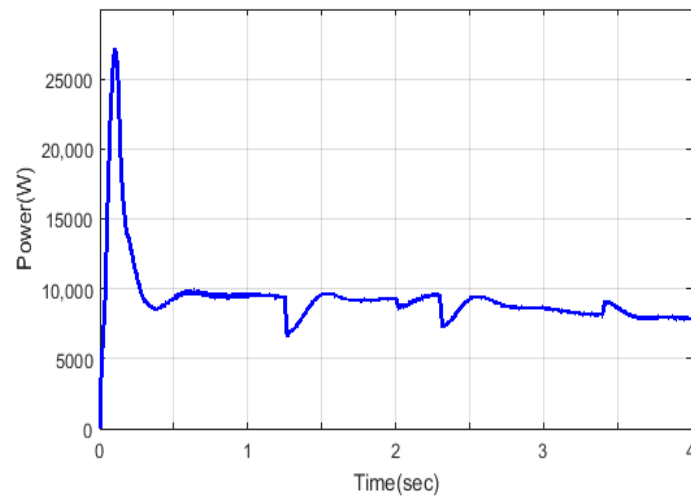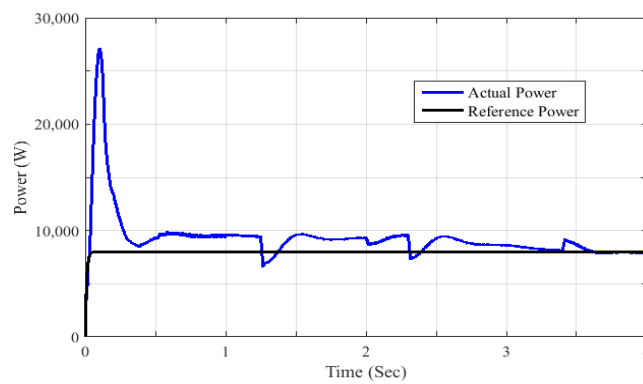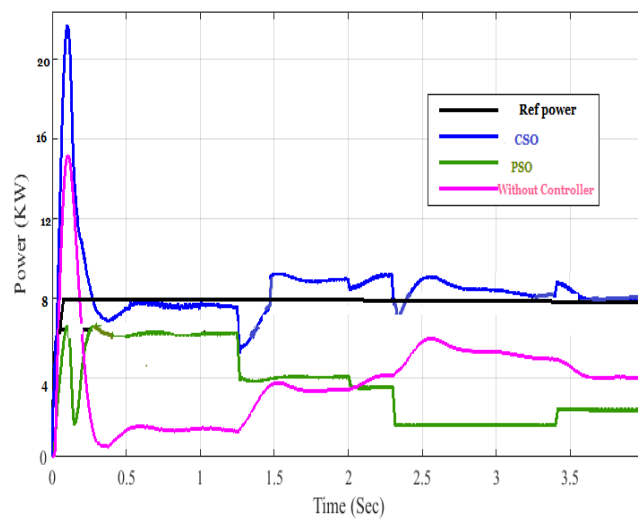

Figure 5**:** wind generated power

(a)

(b)

Figure 6: (a) Generated power with load demand (b) Comparative analysis

Case 2: PV STATCOM operation during nighttime
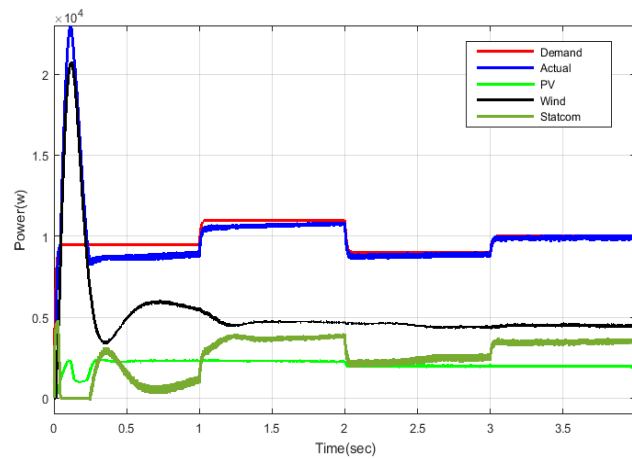

Figure 7: Generated **power with** Load **demand**

For this circumstance assessment, the load request isn't consistent and change between 9000W to 11000W. The figure shows the Load request assessment of the nighttime. Using the projected strategy, the load request is met in the nighttime showed up in the figure 7. Computation time for various methods shown in figure 8 . Table 1 shows the performance anaysis of various techniques
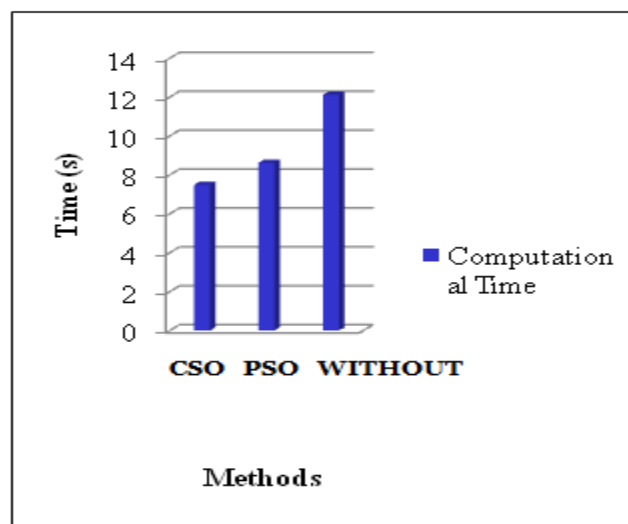

Figure 8: **Computation time for various methods**

Table 1 : Performance analysis

Mode of Operation	Cases		Solarpower (W)	Wind Power (W)	Load demand (W)	PV-STATCOM		Compensated Power		
	Irradiance (w/m2)	Wind speed (m/s)				Store Power (W)	Injected Power (W)	CSO (Proposed)	PSO	Without
Day time mode Analysis	300 w/m2 to 150 w/m2 at 0-4s	1 2 m/s, to 8 m/s at 0-4s	2000 W-8000W	8000 W-10000W	800 0W	Up to 4000W	-	7400 W	67 00W	450 0W
Night time mode Analysis	10-100w/m2	8 -10 m/s	100 W-2500W	5000 W	950 0W, 11000W, 9000W, 1000W at 0-4s	-	Up to 3500W	10500 W	98 00W	800 0 W

4. Conclusion

The control of the PV STATCOM at daytime and nighttime assessment by methods for load variety is explained in this paper. In the identical, the projected procedure simulation with all the parameters have been finished. The suitability of the projected technique was asserted through a comparable examination with different strategies. From the assessment investigation, it has been found that the projected control methodology was very much productive updating the movement of the PV-STATCOM of the scheme than variousstrategies.

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