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# Session : (ISUW) 2024

## Supply-Demand-Based Optimization technology for frequency regulation of a virtual inertia control based microgrid.

***Presented By***

**ADITYA KUMAR PATI, TEAM-LEAD, TPWODL**

# CONTEXT

- Introduction
- Structure of Studied Microgrid
- PID Controller
- SDO
- Generation and Load Variation
- Analysis of Results
- Conclusion
- References

## Microgrid

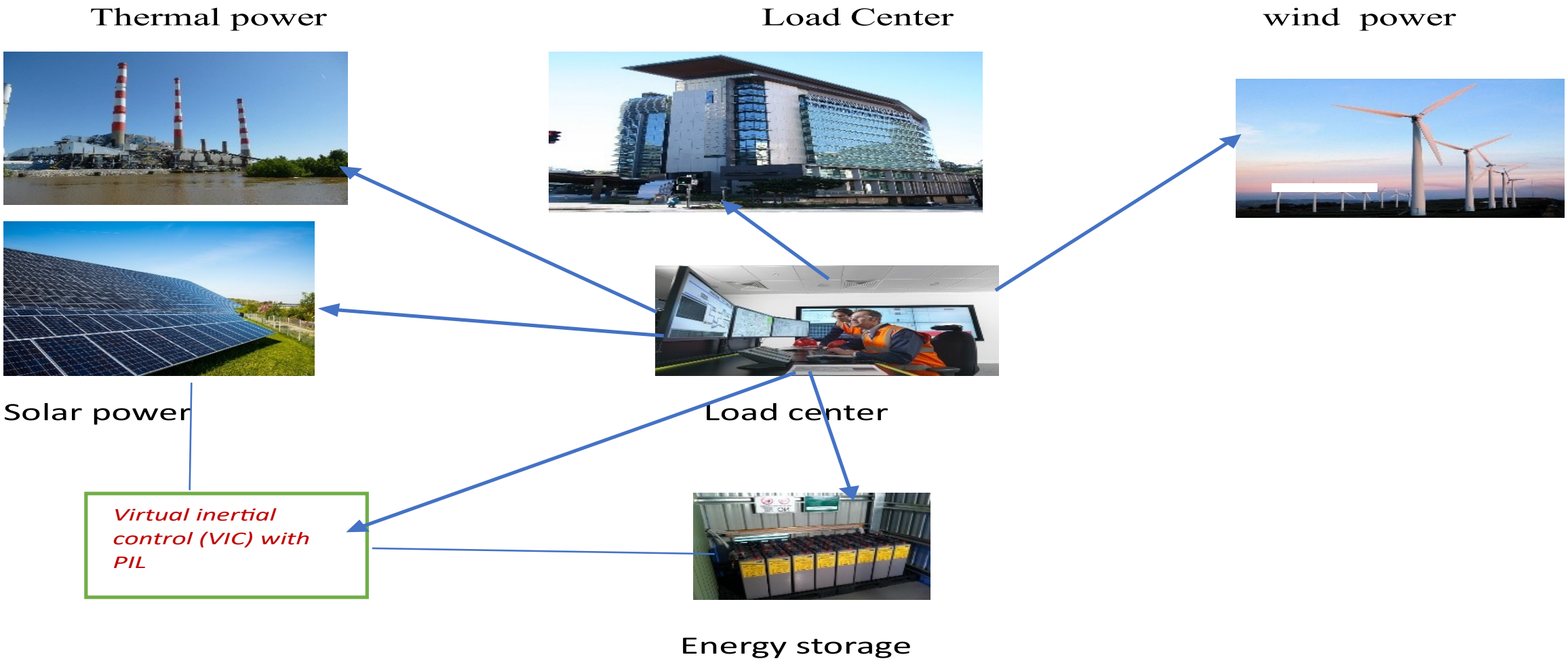
- A microgrid is a group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the grid.
- A good quality of the power system requires both frequency and voltage to remain at standard values during operation.
- The active power and reactive power have combined effects on the frequency and voltage.

Frequency ⟷ Active Power  Voltage ⟷ Reactive Power

## Virtual Inertia Control

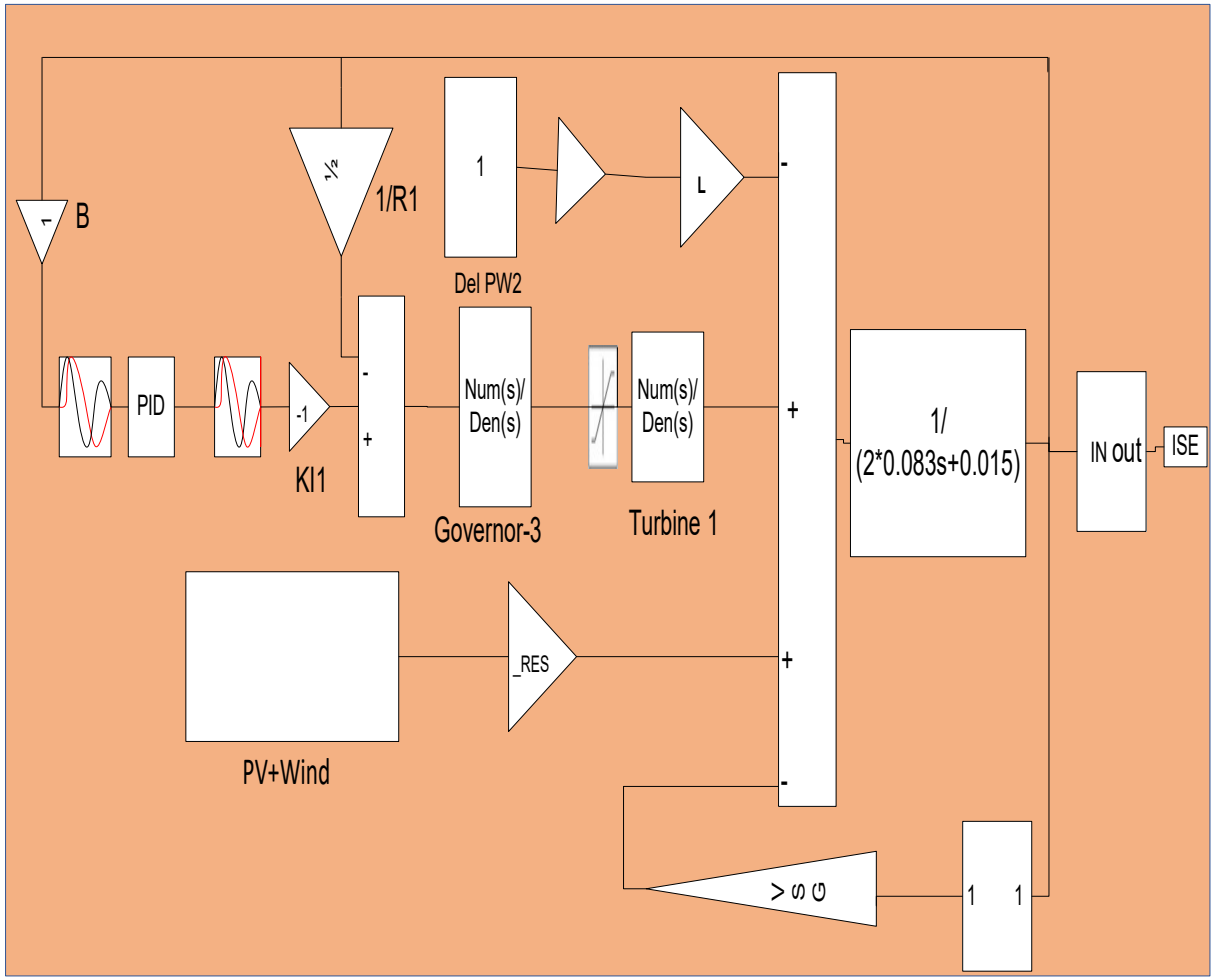
- A growing number of Voltage Source Converter (VSC) based generators in modern power systems results in a decrease of inertia and, consequently, to frequency instability.
- Hence, reduction of inertia in the system threatens frequency stability. Virtual inertia is a solution in the described premises.

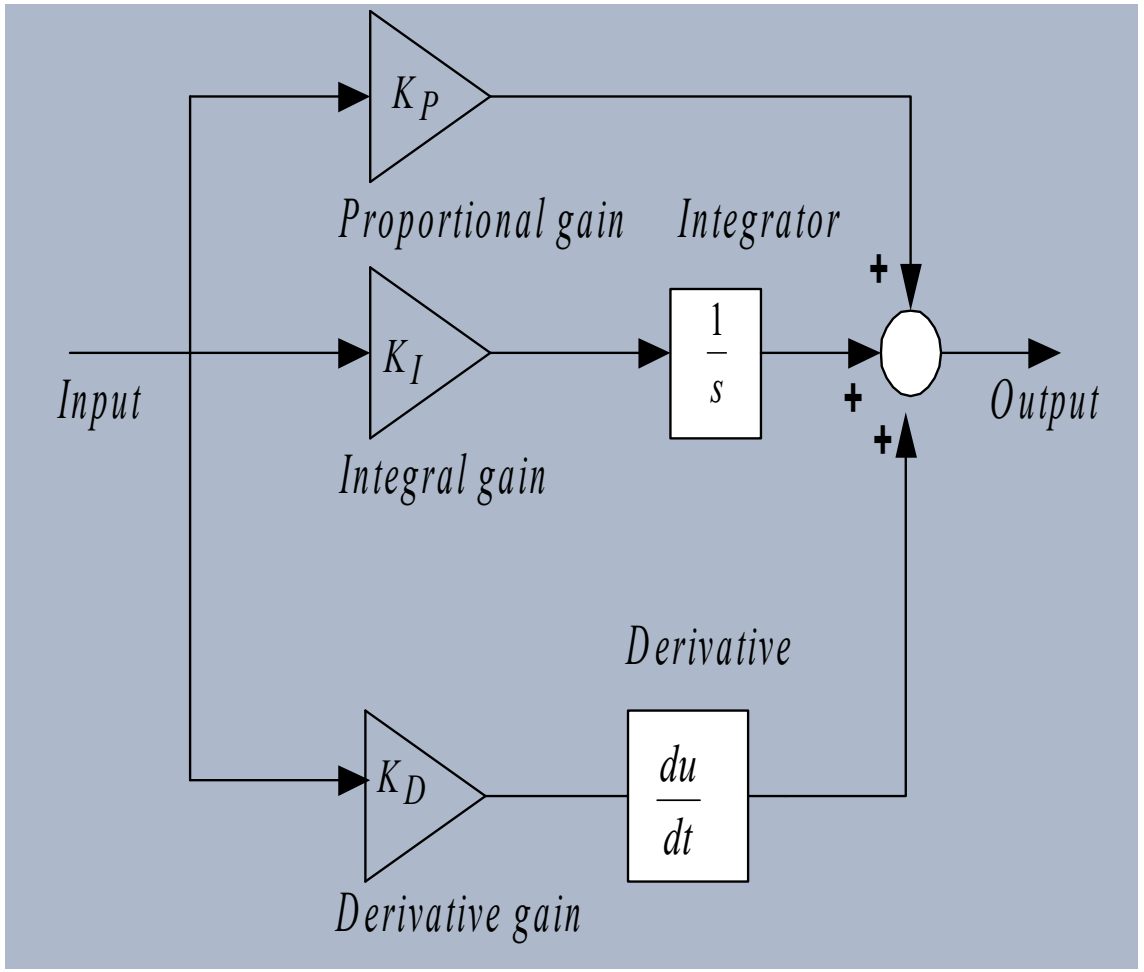
# STRUCTURE OF STUDIED MICROGRID



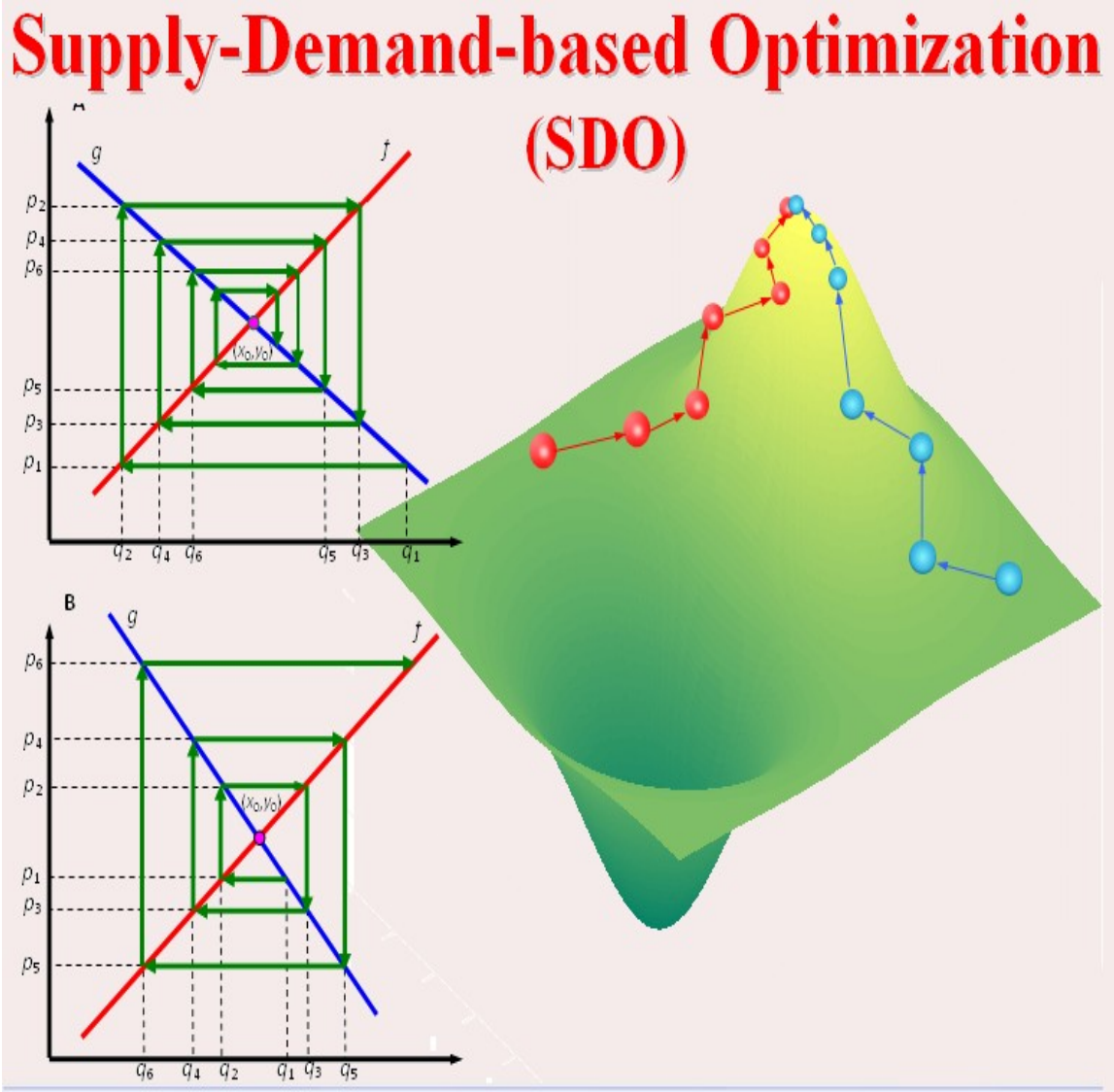
# BLOCK DIAGRAM OF SYSTEM AND CONTROLLER

- The performance of the  system depends on the, controller structure and chosen objective function.
- To control the frequency PID controllers are provided  here.



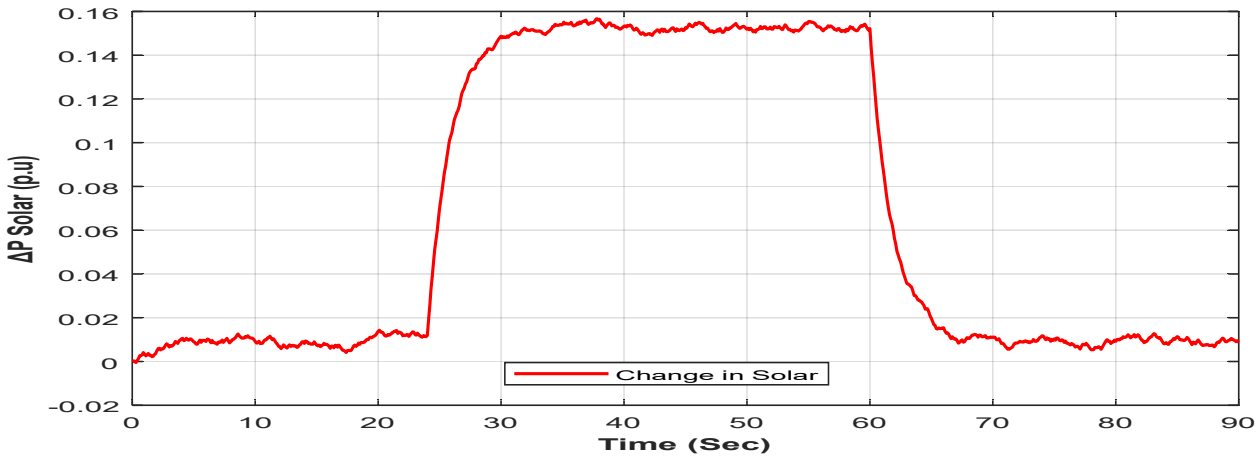



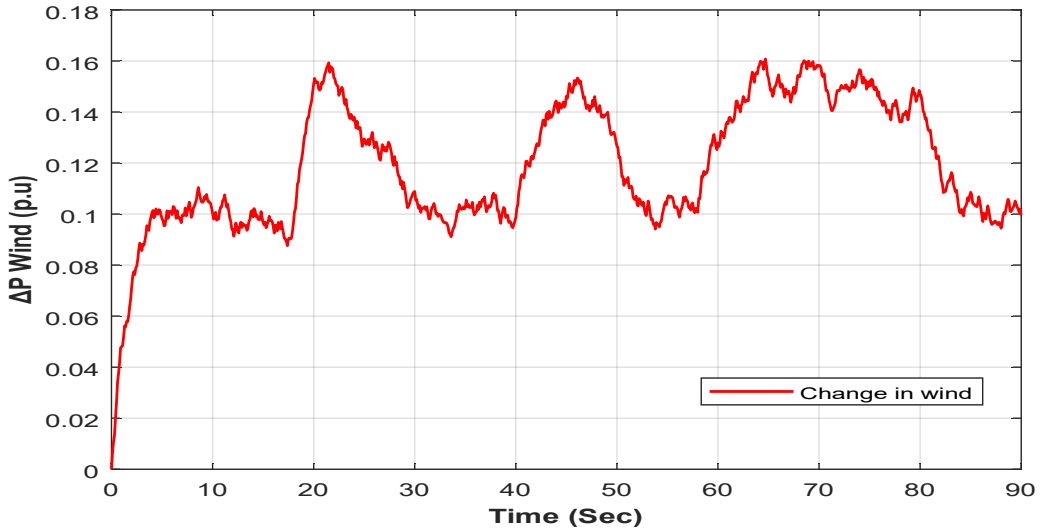
# USE CASE / CASE STUDY

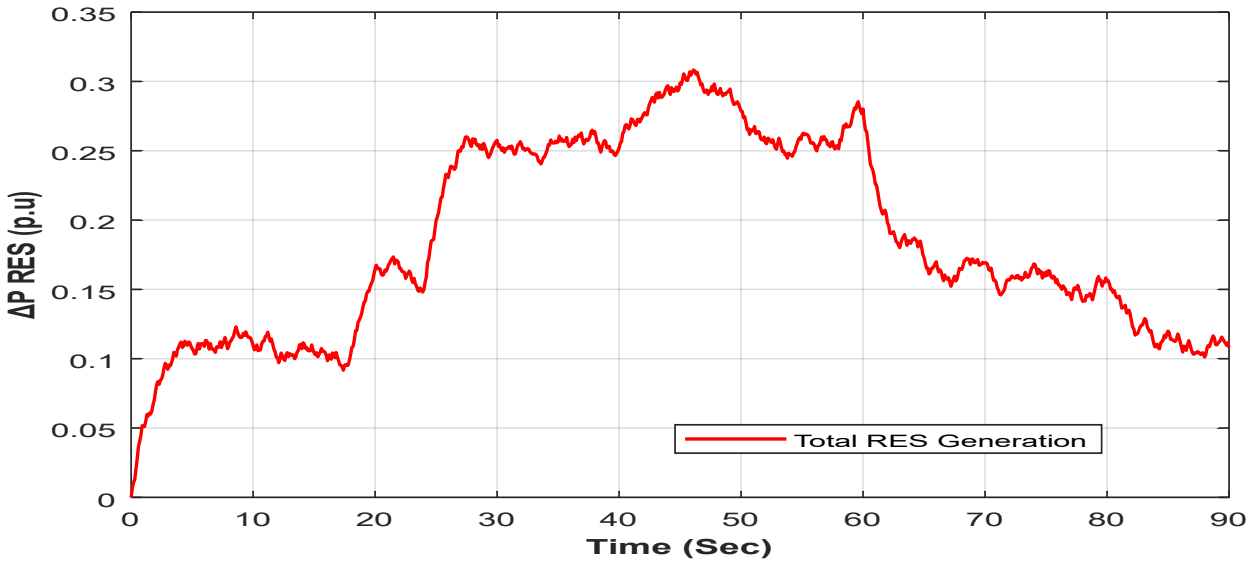


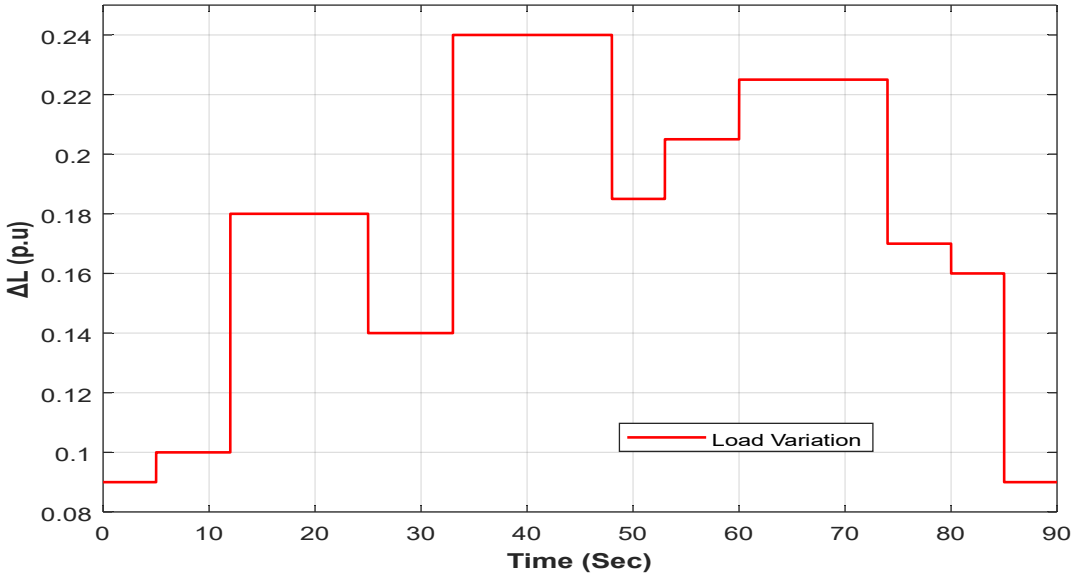

| Strategy/ Controller/ Parameters | Without VI control | With VI control |
|---|---|---|
| | SDO: PID | SDO: PID+VI |
| $K_P$ | 1.9306 | 1.2228 |
| $K_I$ | 1.9984 | 1.8389 |
| $K_D$ | 1.4337 | 0.9634 |
| $K_{VI}$ | – | 1.7885 |
| $K_{VD}$ | – | 1.9838 |
| ISE | 0.0107 | 0.0066 |

# GENERATION AND LOAD VARIATIONS

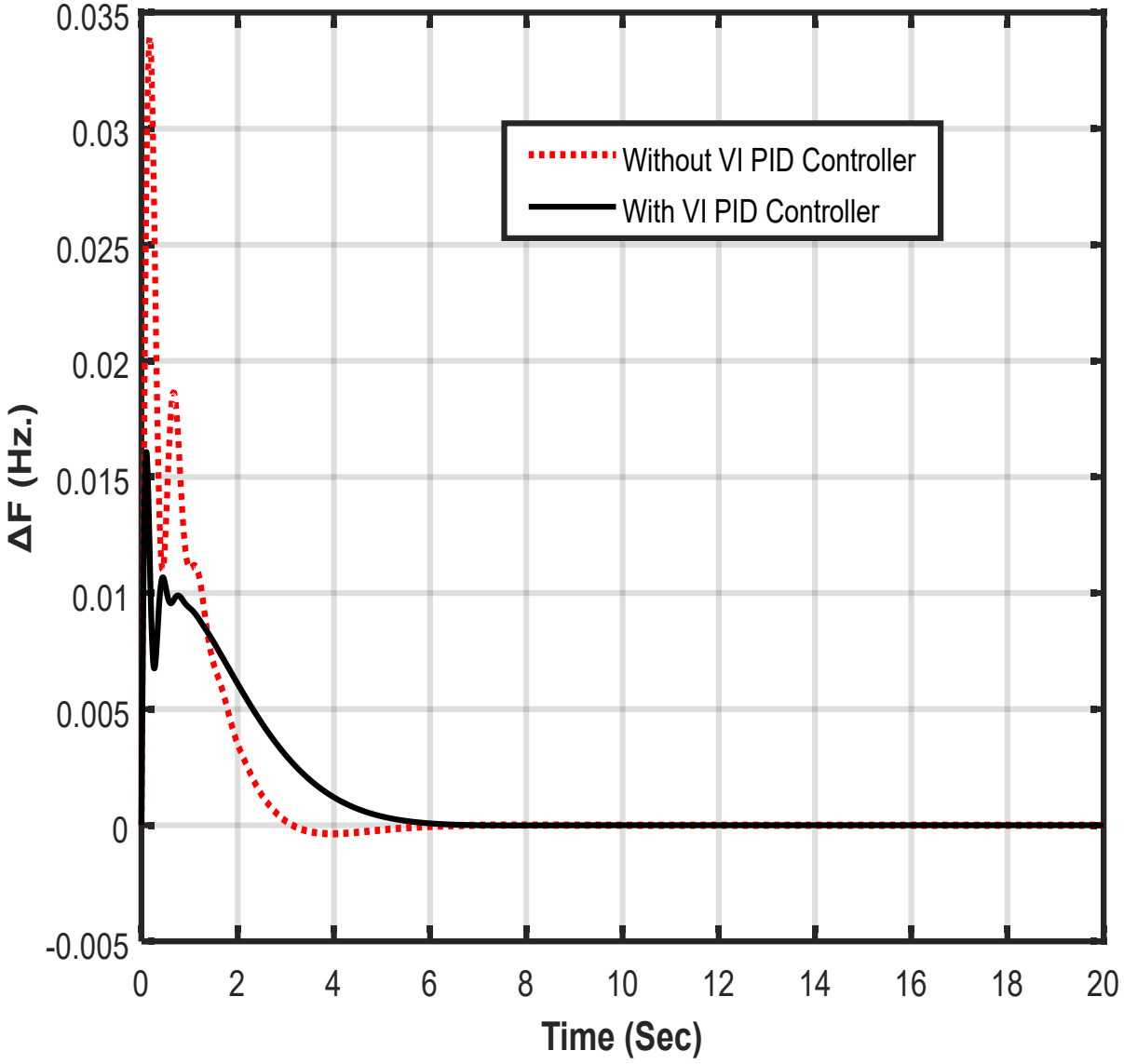


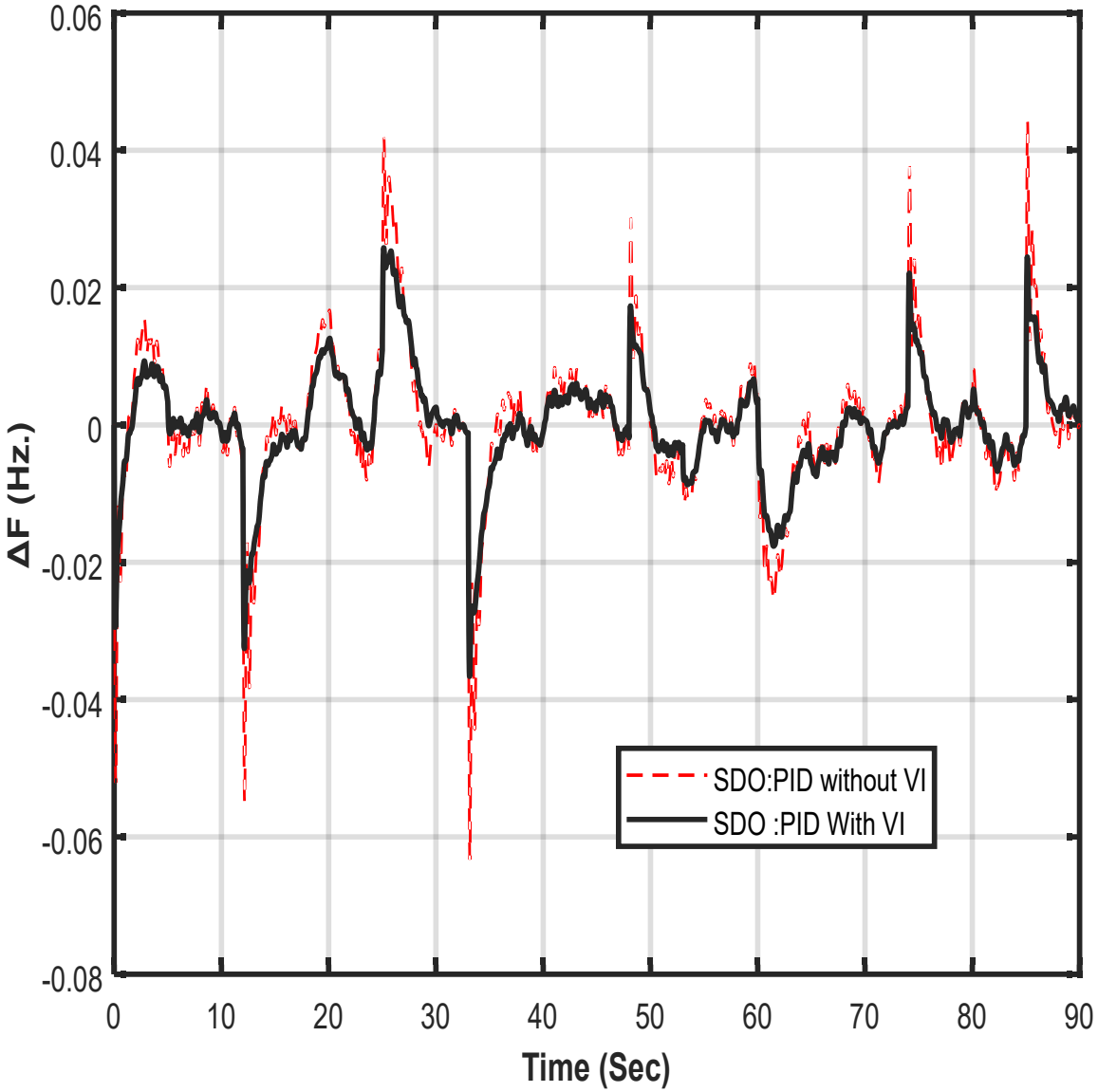



# ANALYSIS OF RESULTS



# CONCLUSION

1. The ISE values are evaluated, in SDO+VI optimization its value is less as compared to SDO.
2. From the result it observed that proposed VI scheme having lesser frequency deviation as compared to non-inertia based.
3. The absolute maximum deviation of frequency was reduced to 0.02 Hz in the final scenario, making performance enhancement of 57.14%.

# THANK YOU

*For discussions/suggestions/queries email:* ***isuw@isuw.in***

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*Links/References*


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