

## Article Overview

Anti-tracking agents manage solar energy output by adjusting panel orientation to prevent overproduction and enhance grid stability, applicable to both grid-connected and off-grid systems.

## Concept of Anti-Tracking

Anti-tracking is a control strategy for solar panels that turns them away from the sun when energy production exceeds a predefined threshold. Unlike traditional tracking systems that maximize energy capture, anti-tracking curtails generation proactively, preventing excess power from reaching inverters or the grid, which can cause inefficiencies or equipment stress . This is particularly useful during mid-day peaks when solar output may surpass local demand.

## Implementation in Grid-Connected Systems

In grid-connected systems, anti-tracking agents operate in real-time coordination with the grid. A signal from the utility or grid operator triggers the panels to move away from direct sunlight, reducing generation before it reaches the inverter. This approach:

- o Reduces inverter and panel heat stress, extending equipment life .
- o Maintains grid stability by preventing overvoltage or frequency deviations.
- o Can be retrofit to existing single- or dual-axis tracking systems, making it cost-effective for modern solar plants . Anti-tracking complements other grid management strategies, such as curtailment and multi-agent system optimization, which can dynamically adjust battery deployment, load shedding, and switch configurations to maintain stability .

## Application in Off-Grid and Microgrid Systems

For off-grid or microgrid systems, anti-tracking agents help balance local generation and load, preventing overcharging of batteries and reducing the risk of islanding hazards. When combined with anti-islanding protection, these agents ensure that inverters do not continue energizing disconnected circuits, which could pose safety risks to personnel and equipment . Key benefits include:

- o Optimized battery usage by limiting excess energy input.
- o Enhanced safety by preventing unintentional islanding.
- o Improved energy efficiency by curtailing production before it becomes waste heat.

## Integration with Smart Grid Technologies

# Anti-tracking agent for power grid and off-grid power systems

Anti-tracking agents can be integrated into multi-agent systems (MAS) for smart grids, where autonomous agents coordinate generation, storage, and load management. MAS frameworks allow:

- o Distributed decision-making across multiple DERs.
- o Adaptive response to dynamic conditions, such as fluctuating solar irradiance or sudden load changes.
- o Scalable control for large networks of solar plants and microgrids .

## Summary

Anti-tracking agents are a practical and retrofittable solution for managing solar energy in both grid-connected and off-grid systems. By curtailing excess generation through controlled panel orientation, they enhance grid stability, protect equipment, and optimize energy storage, while integration with MAS and anti-islanding measures ensures safe and efficient operation in modern distributed energy networks .

This paper presents an anti-occlusion tracking method with multi-feature fusion and adaptive learning rate update

The Grid-Agent framework is an autonomous multi-agent system designed to resolve power grid violations by

Abstract Solar photovoltaic (PV) system efficiency is highly dependent on Maximum Power Point Tracking (MPPT)

Abstract The smart power grid blends the bidirectional energy with information flow. Compared to the traditional power

The grid-connected PV power system and the suggested passive anti-islanding protection are described in Section 2.

With traditional, grid-tied solar systems, your array will stop producing when there is a power outage, even if the sun is still shining!

Anti-islanding protection ensures safety by preventing solar systems from feeding electricity into the grid during power outages,

1.2 Machine learning-based islanding detection in grid-connected inverter A more effective IDM has a lower NDZ and

# Anti-tracking agent for power grid and off-grid power systems

This work provides a synthesis and roadmap for the advancement of intelligent, reliable, and certifiable protection

Anti-islanding protection is essential to ensure that grid-tied energy harvesting systems cut their connection to the grid

Anti-island sensing is a very complex and interdependent process for these reasons. Anti-Islanding in Inverters With

To address the limitations of traditional centralized anomaly detection systems in large-scale power grid

What is Anti-Islanding Protection in Solar Systems? Anti-islanding protection solar is a mechanism built into inverters

This paper presents an overview of recent anti-islanding method developments for grid-connected photovoltaic (PV)

Microgrids: A microgrid is a confined and self-supporting energy system that can operate independently from the main power grid (in

The integration of Artificial Intelligence (AI) into power systems is revolutionizing the way grid stability and efficiency

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