TITLE:- *Simulate Orbital Eclipse & Flux Deficiency Stress Test*

AUTHOR:- ARJUN A.K.A HEET TRIVEDI
EMAIL:- heettrivedi02@gmail.com

Scientific Summary:- This Simulation models a DysonNode Entering Orbital Shadow Phase, such as

- ★ *Lunar Eclipse*
- ★ *Planetary Occlusions*
- ★ *Artificial Obstruction (from other Dyson nodes)*

During this time, Solar Flux drops Significantly, potentially to Zero. The Node must Survive off internal Reserves or Slow its Systems – but must not fallback unless Conditions become Catastrophic (i.e., Dangerously Cold).

Objectives:-

- ★ *Test Thermal Behavior of Node in Low-to-no flux environments.*
- ★ *Log how Internal temperature drops due to flux loss.*
- ★ *Simulate Buffered Operation.*
- ★ *Confirm no Premature fallback,*

Physics Behind It:- When a Spaceborne System enters a planetary Shadow;

- ★ *It receives Negligible Radiative Energy.*
- ★ *Without Energy, Internal temperature begins to fall due to Heat Loss.*
- ★ *Satellites in Earth's Shadow Cool by ~200℃ within 60- 90 minutes.*

In Our Aim;

★ *We Assume 1361 W/m^2 ↠ 200 - 400 W/m^2 during Eclipse.*

★ *Radiative Loss Simulated by slow temperature Decreases.*

★ *Node must maintain Stability until Sun Returns.*

System Response System:-

(i) Shadow flux modeling

↠ $F(t) = 300 + sin(i) * 50.$, *(simulates low- flux turbulence during partial eclipse).*

(ii) Cooling Equation

↠ $Ti + 1 = Ti - \gamma + \delta * (i \ mod \ 5).$, $\gamma = 0.002$ *(passive Radiation to space) and* $\delta = 0.0001$ *(Fluctuations for Instability).*

(iii) Fallback Trigger (Low temperature Condition)

↠ $T < 19.5℃ \Rightarrow fallback = true.$

Expected Results:-

★ *Gradual Temperature Decreases from 24℃ towards ~ 20℃.*

★ *Node Survives ~3000+ cycles before Any Risk.*

★ *Final Log Shows "Eclipse Phase Complete" if fallback not triggered.*

★ *If temperature drops too fast ↠ Node Activates passive heating + logs fallback.*