

Fig.6 General attenuation coefficient of solar arrays variation

Now we make a simulation to predict the output power of solar arrays according to Eq.8.

Simulation condition:

- 1) simulation object: three-axis stabilized GEO satellite made by CAST;
- 2)  $P_{max}$  is given 1100W (single wing maximum output power);
- 3) simulation time:2005-1-1~2013-12-31;

From the simulation result in Fig. 7, we know clearly that output power is decline continuously with time and we could predict the output power precisely for long time based on the model.

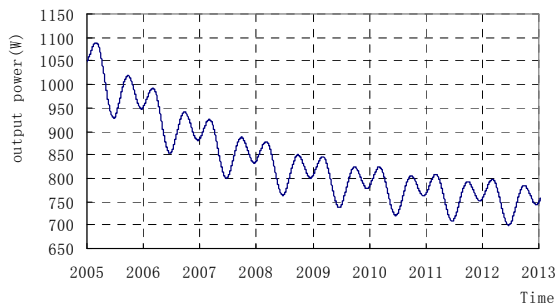


Fig.7 Output power of solar arrays variation with time

#### IV. Output Power of Solar Arrays Affects On-orbit Satellites

When three-axis stabilized GEO satellite is in the stage of BOL, MOL (Middle Of Life), output power of solar arrays is able to meet the need of satellite load and keeps the satellite power balance<sup>[6]</sup>, although output power is gradual decrease. If the satellite is in EOL, its load does not change greatly relatively to in BOL and MOL. However, output power of solar arrays declines greatly, especially it is in summer solstice and midwinter, it is possible that the output power can not meet the load need and affect the satellite application. So we should pay great attention to satellite output power, predict the power wane time and take efficient scheme to avoid power wane.

In order to avoid power wane when on-orbit satellite is in EOL term, we set up a scheme (Fig. 8).

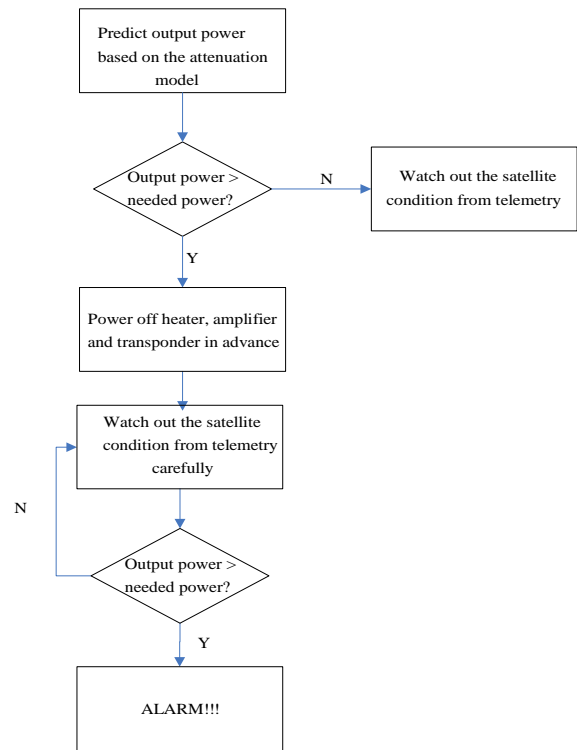


Fig. 8 Avoid power wane scheme

From Fig.8, we know that if output power can not meet the need according to output power prediction, we will shut down some facilities which consume too much power. However, if we often power off the heaters, amplifiers and transponders in satellite, it will reduce greatly the satellite applied value. So the engineers who design and manufacture satellites should take into account the power need and power supply, and guarantee the power supply and consumption balance.

#### V. Conclusions

Output power of solar arrays is key unit to three-axis stabilized GEO satellite. In this paper, we choose CAST GEO satellites as targets to analyze the short-term and long-term output power variation of solar arrays, and establish the output power attenuation model of solar arrays from CAST satellites telemetry. Based on the model, we set up the scheme to avoid power wane in satellites routine management.

#### References

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