

The Views of the Association of Engineering Professionals in Society (AES) on Environmental Regulations in the Future Electricity Market in Hong Kong

Support Government Policy Objective

1. We support the existing Government policy objective of ensuring that the public can enjoy **reliable, safe and efficient energy supplies** at **reasonable price**, and to **minimise the environmental impact** caused by the production and use of energy.
2. We are concerned about how the future regulatory regime could help improve the environment, in particular **air quality**, as there is a close relationship between power generation and air quality.
3. We are supportive of imposing **reasonable and workable** emission caps on major pollutants with the renewal of the licences of individual power plants, enabling Hong Kong to achieve the emission reduction targets as agreed with the Guangdong Provincial Government with a view to improving the regional air quality.

Government's key suggestions on environmental regulations

4. There was concern of air pollution by the two companies as they use coal-fired generators. To address this, the Government has proposed a regulatory framework of helping to improve air quality by introducing new penalties and awards to encourage the power companies to meet emission reduction requirements and use more renewable energy and cleaner energy, such as natural gas.
5. Since mitigation facilities are well proven, there should be sufficient incentives for the power companies to achieve the required environmental performance by retrofitting their existing coal-fired units with emission reduction facilities than by phasing out these coal-fired units prematurely and replacing them with cleaner energy.

Rates of return of investing on emission reduction facilities

6. Proposing the lowest rate of return for emission reduction facilities contradicts the "user pays" principle and fails to provide the necessary incentive.

Environmental Improvement Proposals

7. The Government's two proposals, of adopting the lowest return rate for environmental improvements on coal-fired units and imposing penalty on all assets against unilaterally and arbitrary set emission targets, are environmental disincentives and unreasonable investment risks.
8. We consider that there should be clear, long term and integrated energy and environmental policies with respect to the fuel mix, security of fuel supply, and role of coal and natural gas in Hong Kong. Questions need to be answered such as: Does Government want coal to continue to be one of the fuels for Hong Kong in the next 10-15 years? Does Government want to increase gas generation? How will the Government ensure that sufficient gas will be available to the power sector? Clear answers to these questions will appropriately lead to establishment of consistent environmental regulations which set emission targets with some reference to practicality of fuel mix and overall cost to the society. At the moment, emission targets are dealt with on an arbitrary basis, which is not in the best interest of the society.

9. Further lowering of the tariff is likely to encourage higher power consumption by members of the public and is against the promotion of environmental protection because it inevitably tends to increase emission. In this aspect, we would rather have the approach be set towards demand side management, energy audits, and public promotion of energy conservation and savings in energy usage.

Renewable Energy

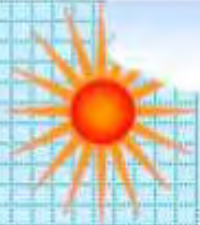
10. The Government's proposals for renewable energy (RE) development are in no way sufficient to encourage other parties to develop RE projects, except the two existing players or in conjunction with them. **Incentives** should also be provided to promote the use of RE by individual consumer/user. The differential returns set down for emission reduction and RE would skew the incentives of the power companies.
11. There are many successful local pilot building integrated photovoltaic projects with experimental solar panels installed on building roofs and sidewalls. In view of the relatively small available roof top areas of buildings in Hong Kong, power generation by roof-mounted solar panel systems is limited.
12. Sloping terrain covers over **half** of the land area of Hong Kong. With the rapid technological advancement and substantial lowering of solar panel prices, we also propose trial projects to explore the potential uses of many of the under-utilised slope areas to install solar systems to meet part of our energy demand in future (see attachment).

Emission Trading Scheme (ETS)

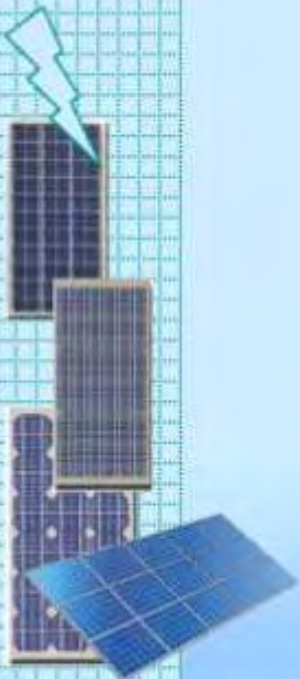
13. A meaningful Emission Trading Scheme requires detailed consideration of all aspects and sufficient number of participants from the region, involving very close, complex and integrated cooperation between Hong Kong and Guangdong Province. We are seriously lacking sufficient details of the ETS, such as environmental performance standards, fair and equitable emission cap allocation, monitoring, verification and enforcement mechanism, administrative cost sharing, etc., any further efforts on its evaluation are therefore hampered. However, any ETS devised should be fair, equitable, transparent, supported by the public, and not at the expense of the Hong Kong public.
14. Investing in environmental mitigation facilities and employing cleaner fuels is far more effective in resolving our own emission problems.

Corporate Social Responsibilities

15. Whilst we should not be jealous of the two existing power companies for their recently announced huge profit, the companies should also recognise what they owe to their long time customers, the Hong Kong people. They should undertake more of their corporate social responsibility initiatives to pay back the society in a number of ways, such as self-initiated tariff cut, rebates, public education in energy sustainability, research and development in renewable energy, free energy audits, etc.



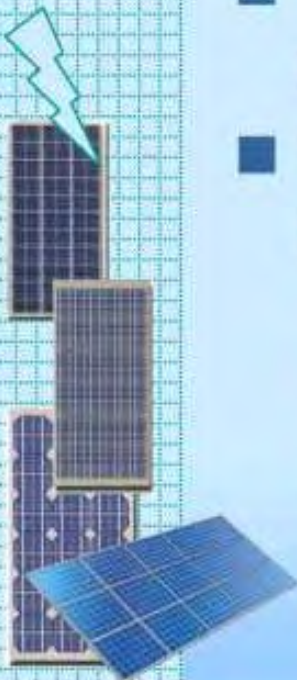
Slope Integrated Photovoltaic





Renewable Energy

- Sustainable development is included in HK's long term planning strategies
- HK's present energy supply depends on fossil fuels & nuclear power
- HK Government committed to limit green house gas emission to reduce global warming
- We should start to develop alternative sources of energy which are clean and renewable
- Wind & Solar are the two most potential Hong Kong





What is Solar Energy

Solar Thermo – direct heating by sun light



Solar cooker

Solar thermo water heater

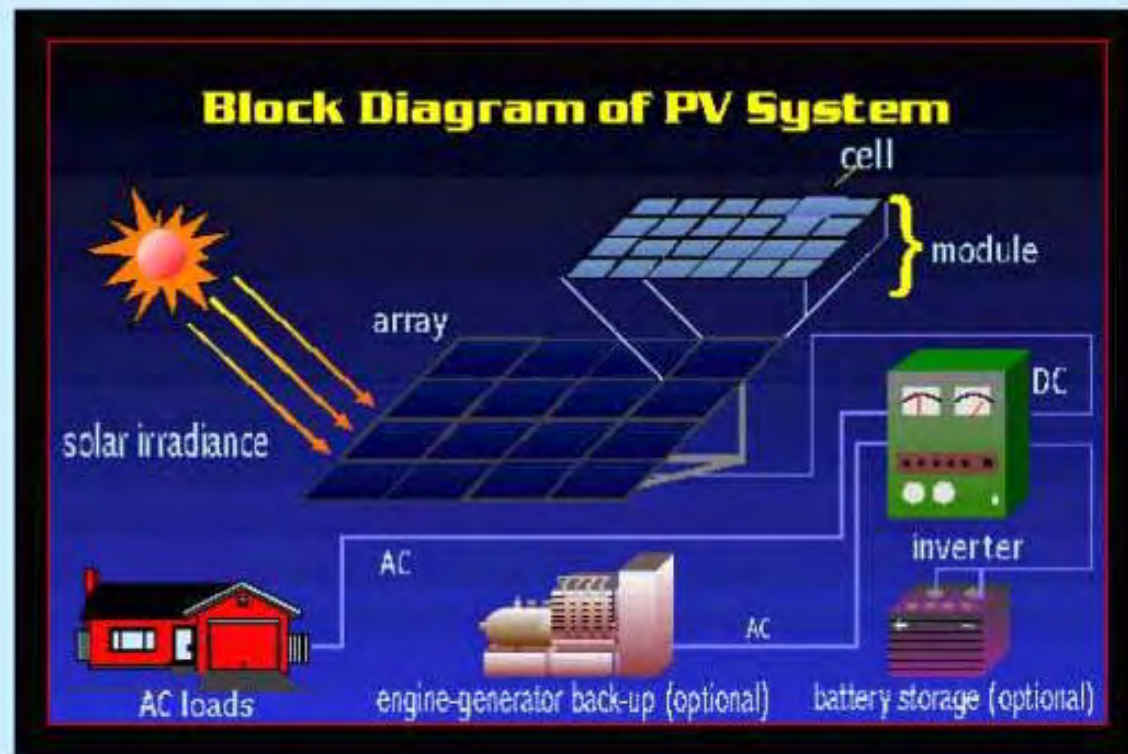




What is Solar Energy

Solar Photovoltaics (PV)

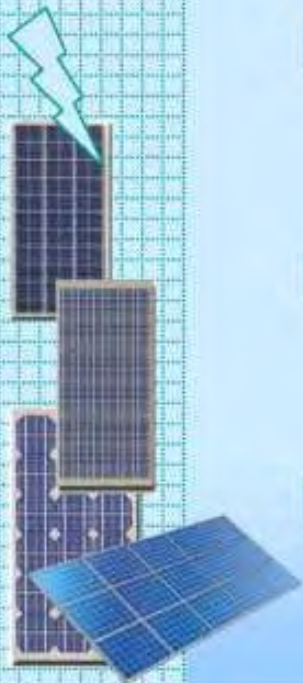
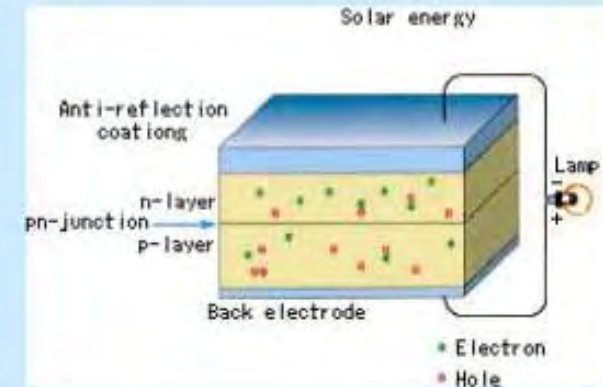
- generation of electricity by sun light





Technology Overview

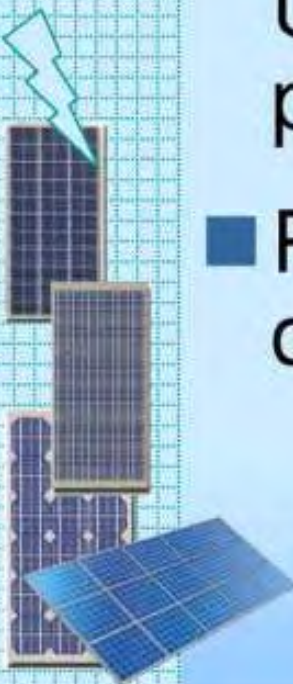
- Sun light emission carry photons
- Semiconductor materials absorb photons to release electrons
- A series of PV cells are connected to generate electricity from sun light
- DC from solar cells can be converted into AC with an inverter
- Electricity can be used immediately or stored in batteries





Technology Overview

- PV is a proven technology
- Solar cell modules are easily available in the market
- World PV market in 1993 greater than US\$750 million and growing at 20% per year
- Present cost US\$0.25 / kWh and dropping, becoming cost effective





Solar System Applications

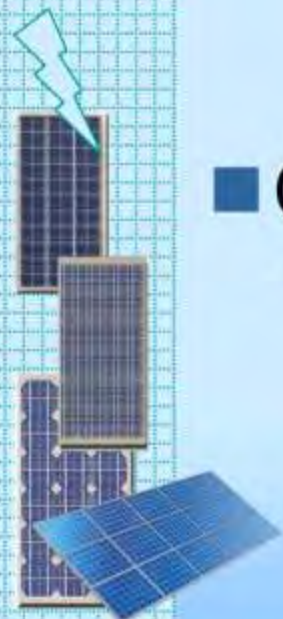
■ Lighting

- ◆ for residential/commercial needs, billboards, security, traffic sign, street lights, bus station, remote villages etc.



■ Communication

- ◆ remote relay stations, cellular network antennas, emergency telephone etc.





Solar System Applications

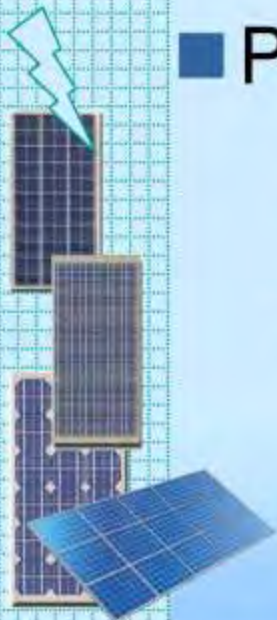
■ Utility Grid

commercial scale
electricity generation to
support peak load during
daytime



■ Pollution Mitigation

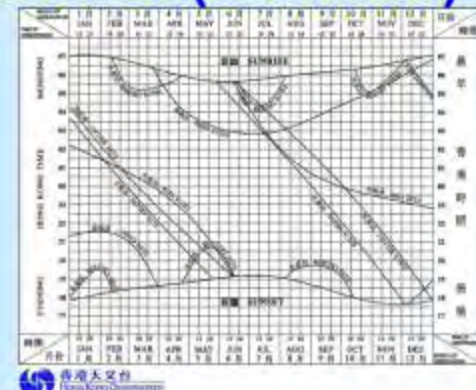
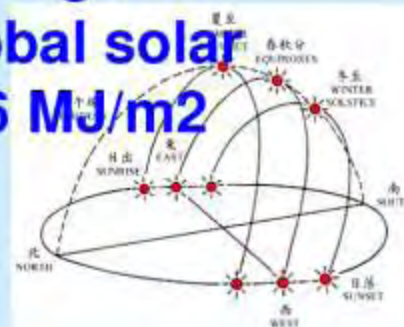
solar powered charging
stations for electric cars,
air conditioning for idling
vehicles





Solar Resource in Hong Kong

- Hong Kong is located in a relatively rich sunshine region
- According to HKO Almanac 2001 :
 - ◆ Average amount of cloud 65% over the sky
 - ◆ Annual bright sunshine duration 1948.1 hours (44% of the time)
 - ◆ Shortest of sunrise to sunset 11 Hour in June
 - ◆ Angle of elevation of sun at noon 89 (Summer) to 44 (Winter) degrees
 - ◆ Mean daily global solar radiation 14.46 MJ/m²

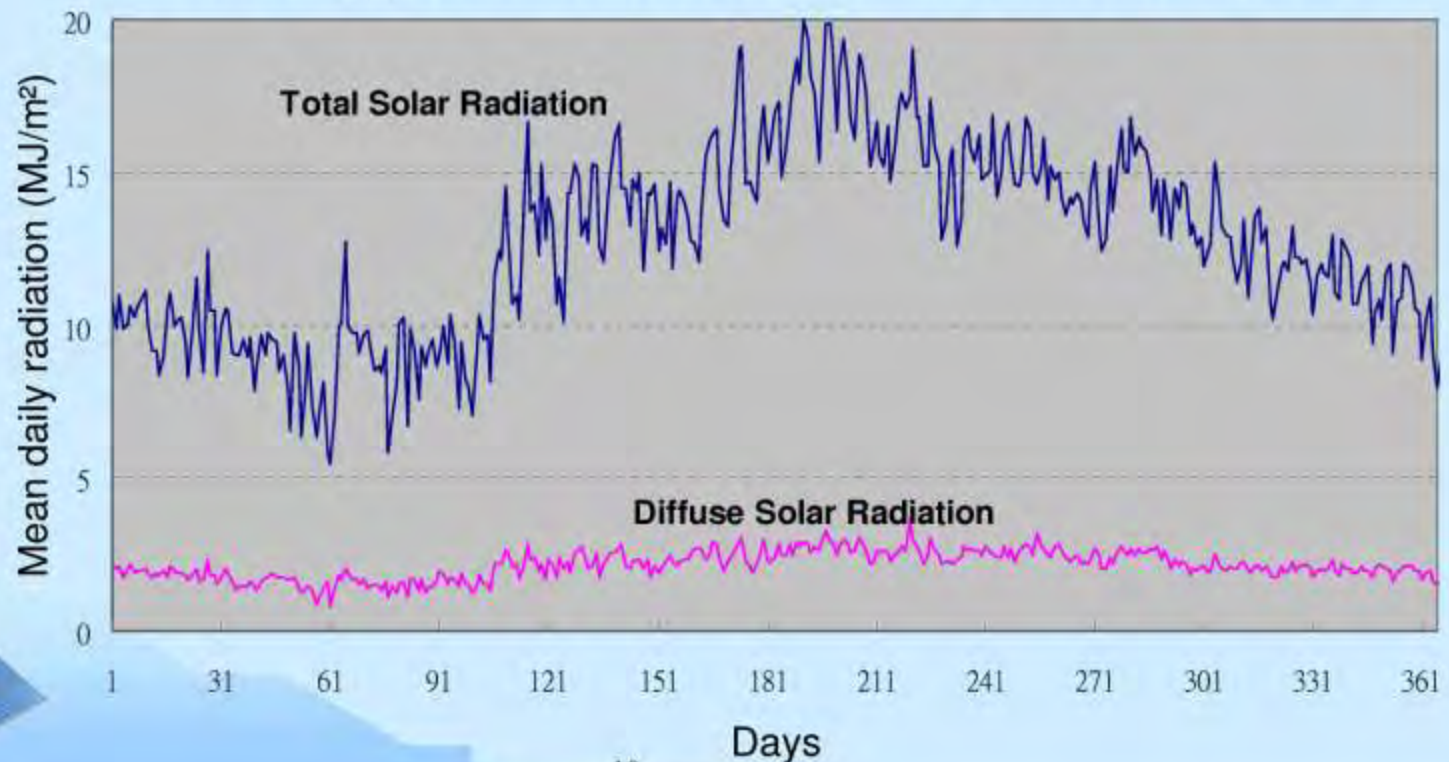




Solar Resource in Hong Kong

- ◆ Statistics from 1979 to 1987 by HKO indicates consistent distribution and limited fluctuations of total solar radiation

Mean daily global and diffuse solar radiation on a horizontal surface

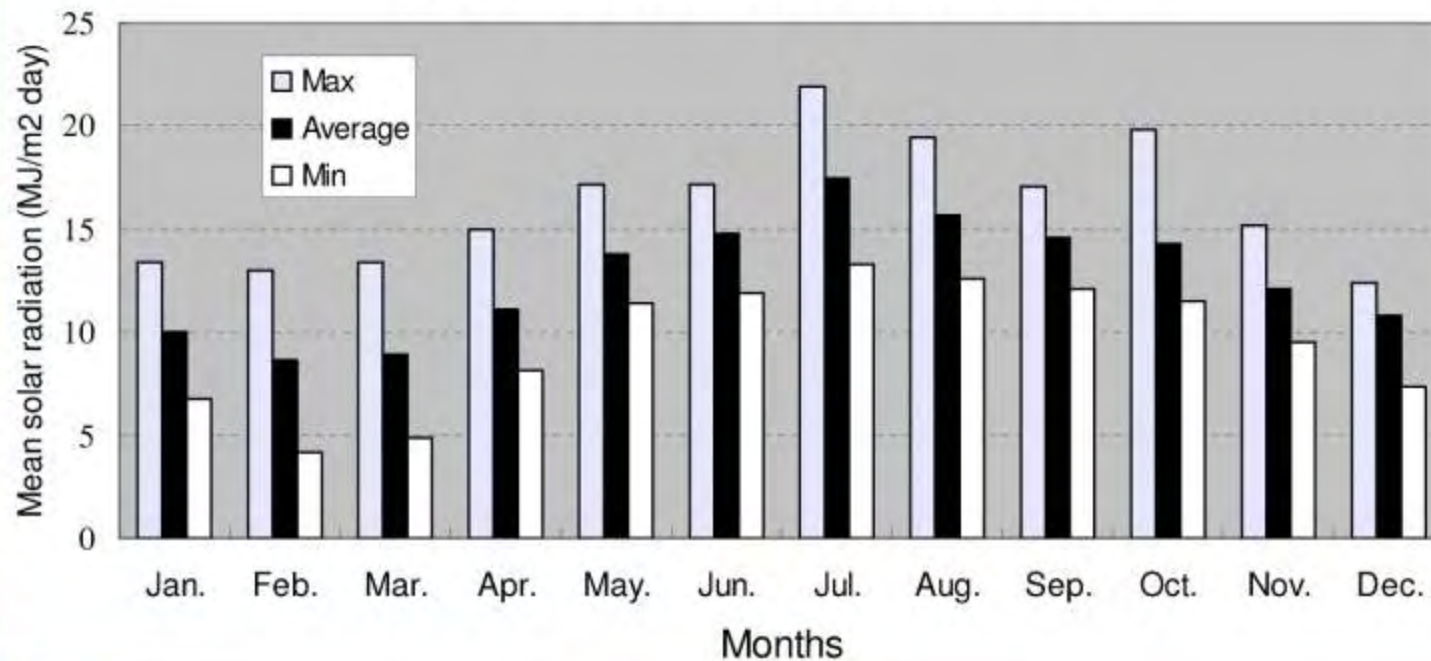




Solar Resource in Hong Kong

- Monthly distribution of radiation indicates even in cloudy & rainy months of spring, solar radiation still not too low

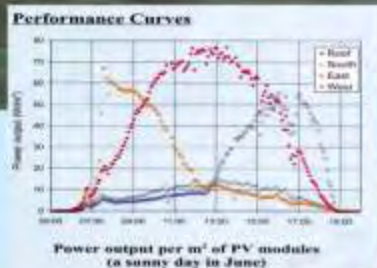
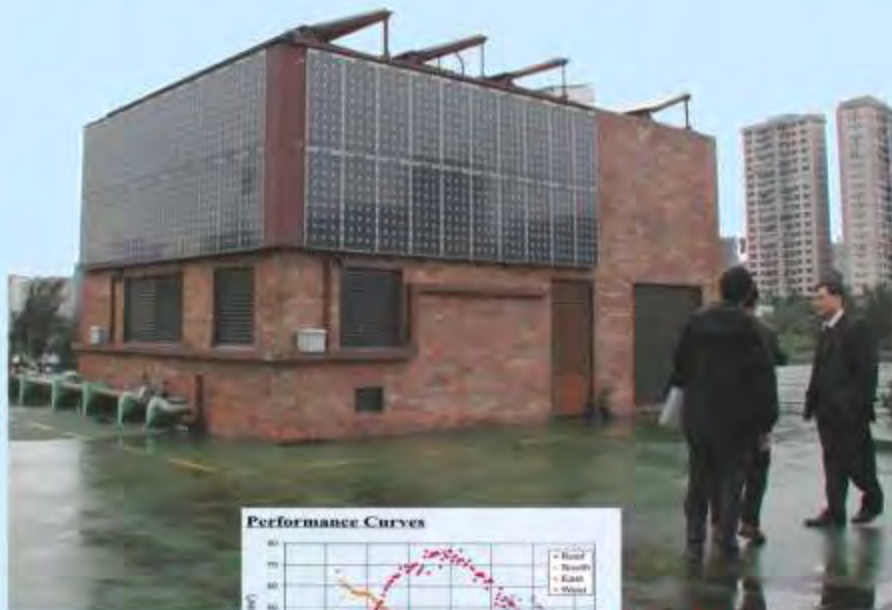
Solar radiation per month





Solar Resource in Hong Kong

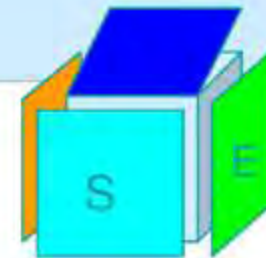
- Building Integrated Photovoltaic Project - HKPolyU
- Experimental solar panels on roof and side walls



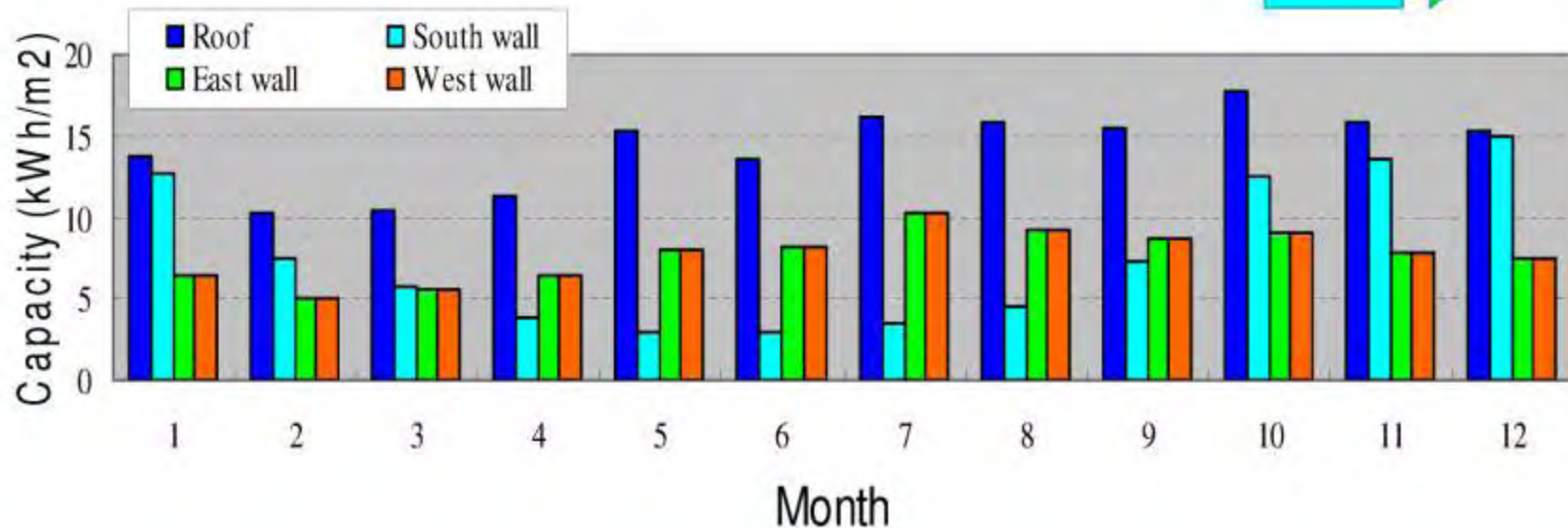


Solar Resource in Hong Kong

- Electricity generated from solar panels installed in different directions



Annual power generation

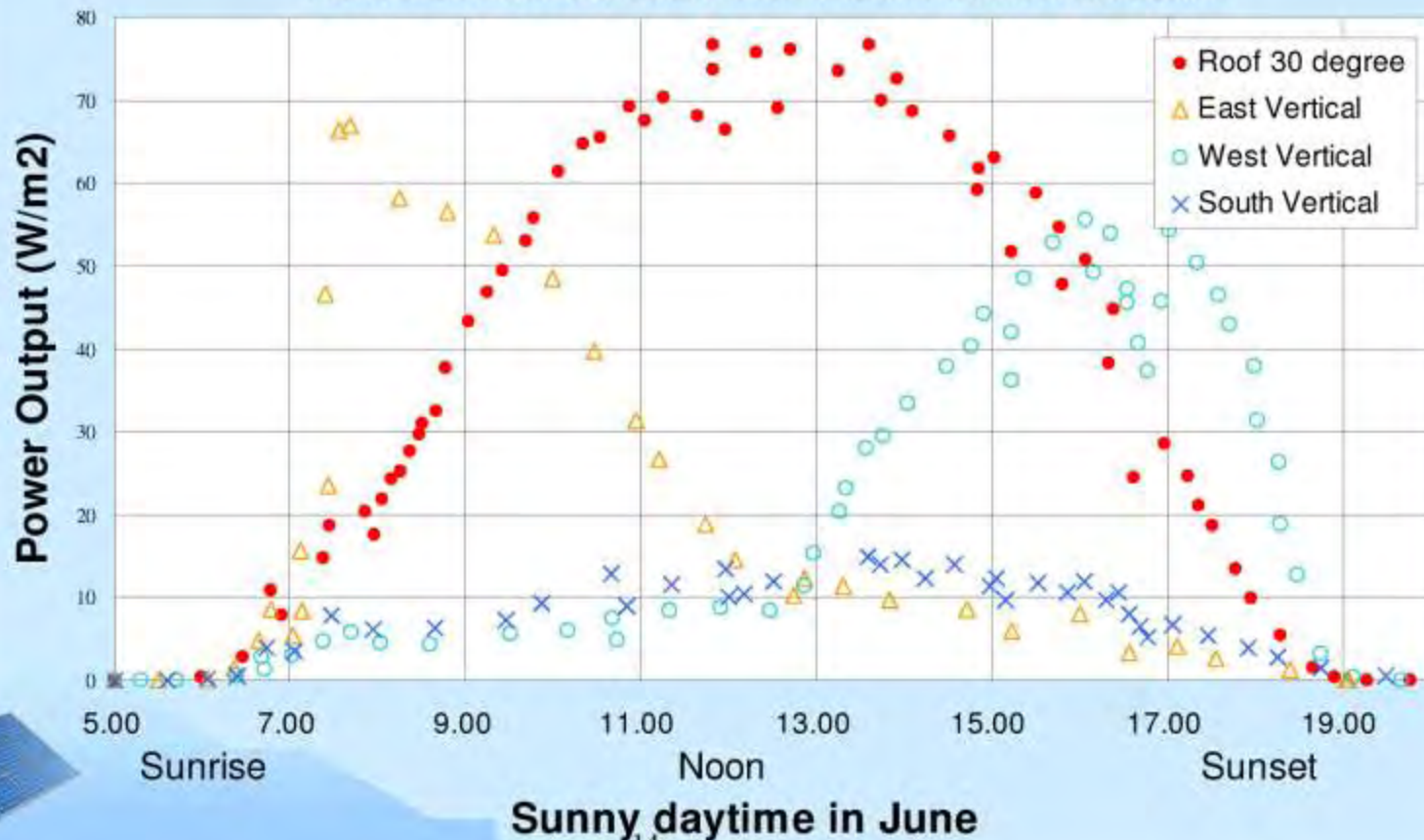




Solar Resource in Hong Kong

- Daily response of solar panels on roof and side walls

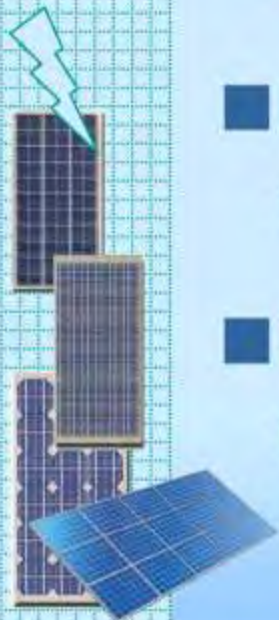
Performance Curve of Solar Panels installed in Different Directions





Why Using Slopes for Solar

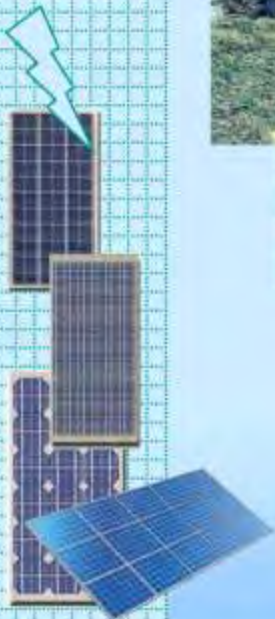
- Footprint of buildings too small
- Roof top space occupied
- Flat lands are too valuable
- Slopes are land without cover





Example Cases of Solar Slope

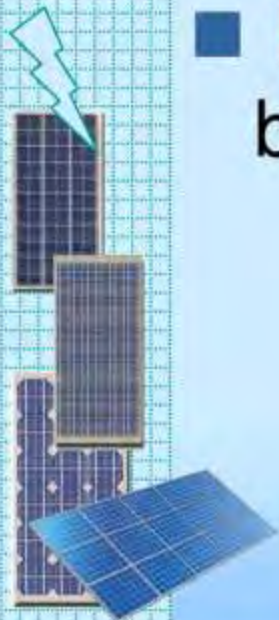
- Solar panels installed on slopes

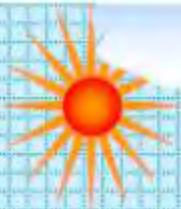




Selection of Slopes

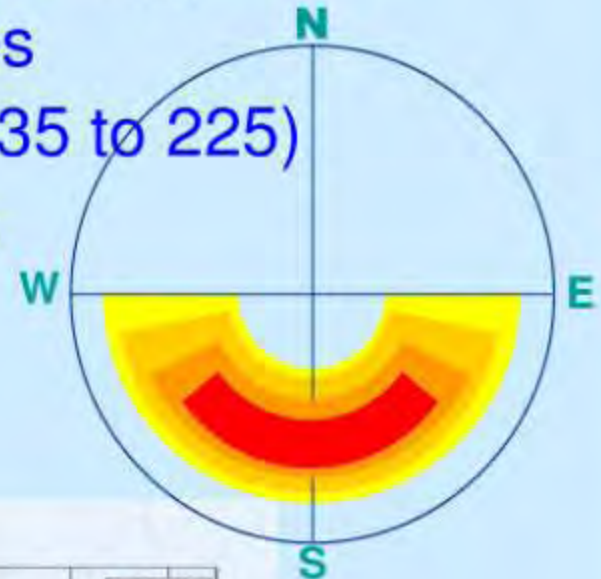
- Solar panels are best installed facing South, SE or SW
- Tilted at an angle equal to degree of latitude (Hong Kong 22 degree 18 N)
- Expose to direct sunshine, not shaded by buildings or trees



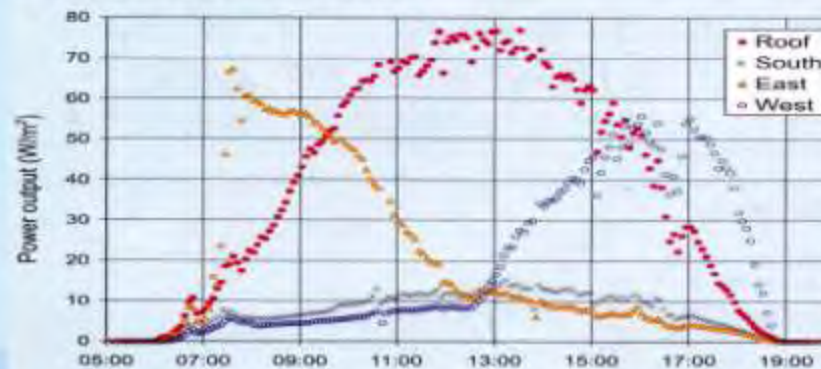


Selection of Slopes

- Suitable slopes for solar energy are :
 - ◆ Inclination 30 to 60 degrees
 - ◆ Orientation SE, S & SW (135 to 225)
 - ◆ Hard surface without trees
- Depends on pattern of electricity consumption



Performance Curves

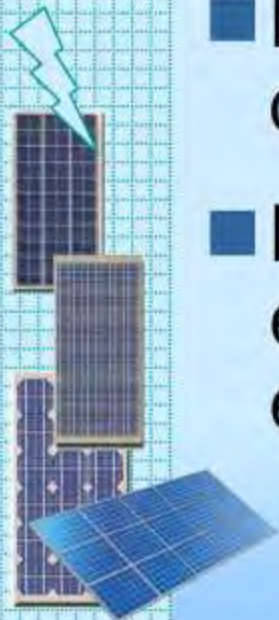


Power output per m² of PV modules
(a sunny day in June)



Obstacles for Solar Energy

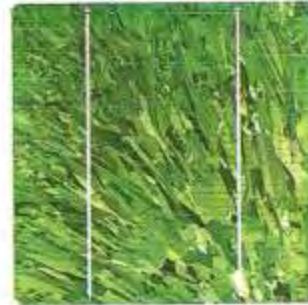
- Relatively higher initial cost and large covered area
- Protected power network, connection to power grid is not allowed
- No financial incentive for electricity companies and end users
- Not enough awareness on adverse environmental impacts of fossil based energy



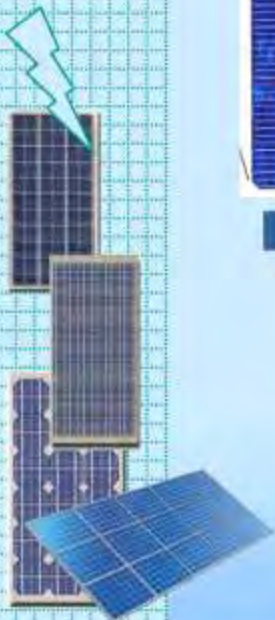


Visual Impact

- Best to cover concrete slopes
- Solar cells are now manufactured in various colors



- Mix with dummy panels, light panels and other purpose-made panels for graphic and aesthetic design





Education Value

- Good to promote renewable energy
- Can be used as demo for environmental education
- Solar Schools developed in many countries





Solar School Project

- Suggested to implement a pilot scheme of Solar School in Hong Kong

Solar Schools Project

