

2006 Great Wall Renewable Energy Forum

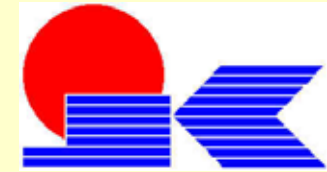
Current Statues of PV in China

Wang Sicheng

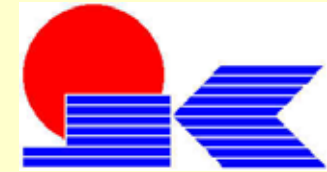
Beijing Jike Energy New Tech. Development Co.

Oct. 23-27, 2006

CONTENTS



1. PV Role in Energy Supply
2. PV Market in China
3. PV Industry in China
4. PV Application in China
5. Renewable Energy Law
6. Conclusions

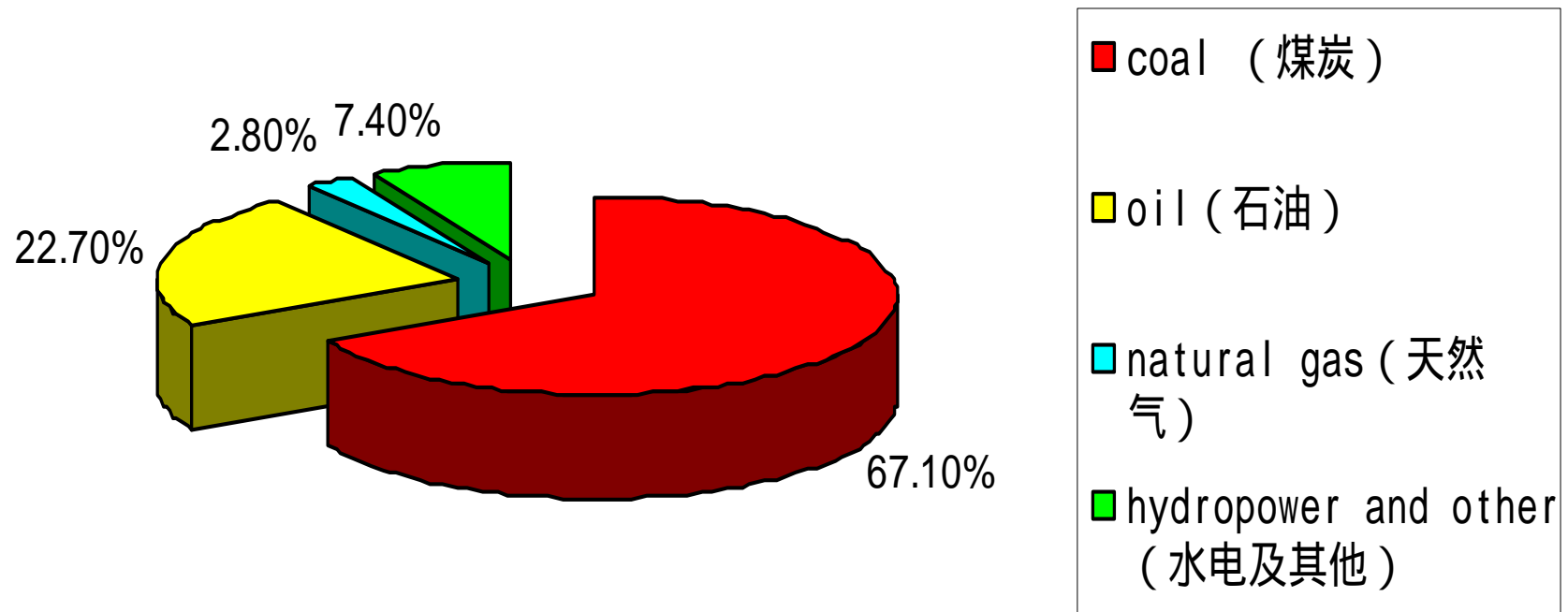


1. PV Role in Energy Supply in China

Share of Energy Consumption in 2003 (Shi Lishan)



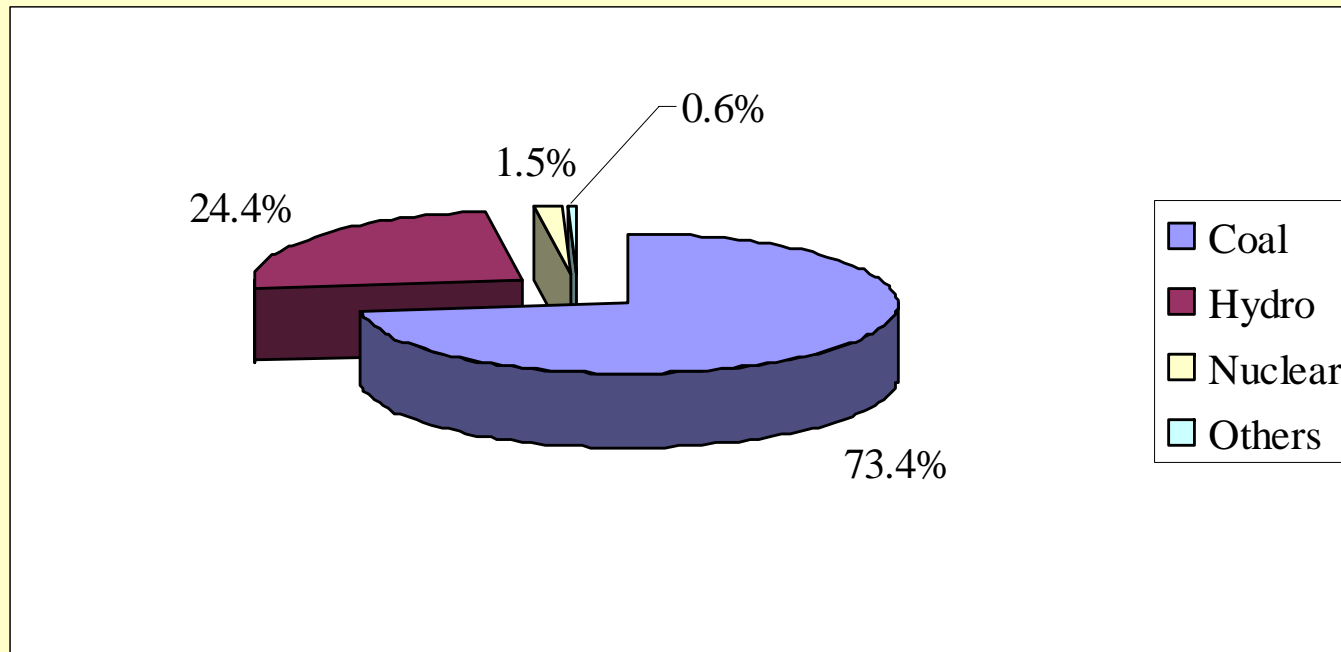
Composition of Energy Consumption (2003)
能源消费构成 (2003年)



Installed Power Capacity in 2004 (China Electric Power Research Institute)



Type	Coal	Hydro	Nuclear	Others	Total
2004 (GW)	324.9	108.26	6.84	2.80	442.8
%	73.4	24.4	1.5	0.6	1

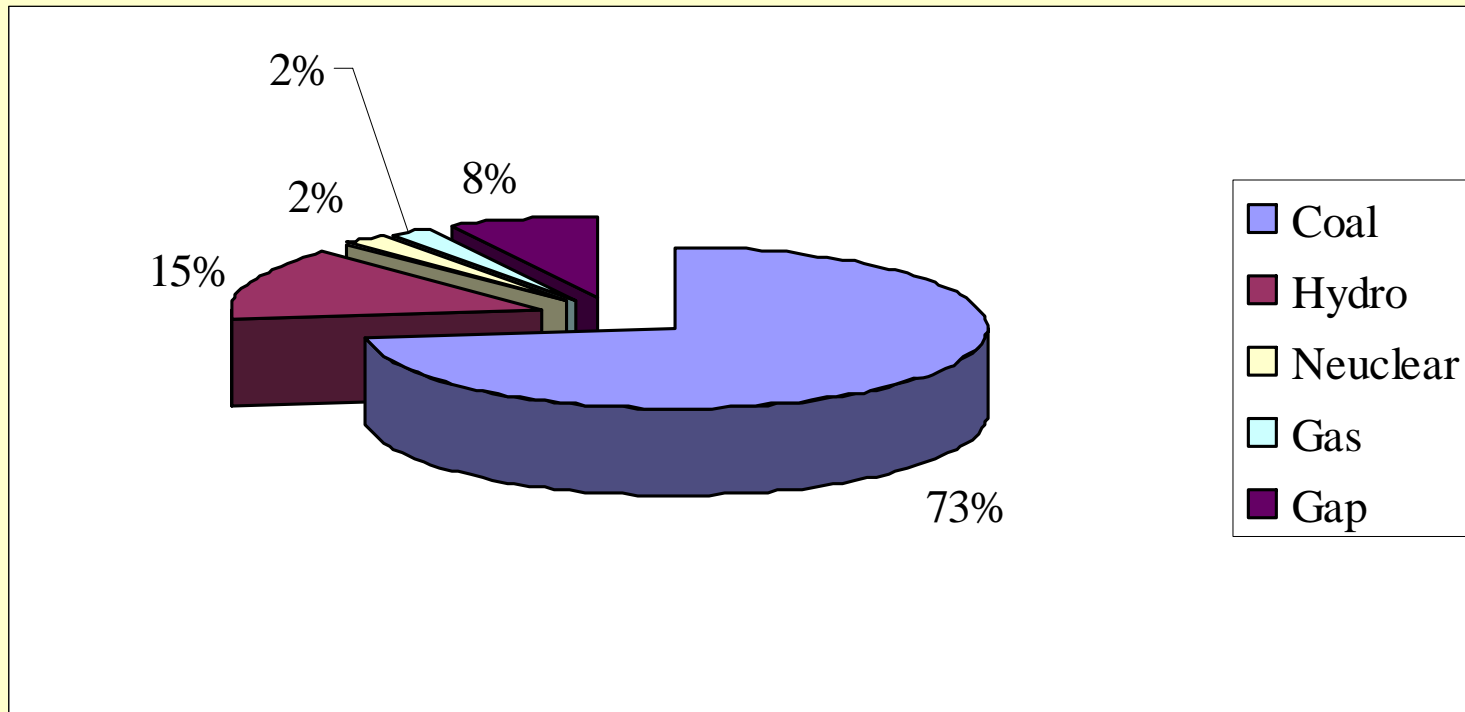




Calendar Year	2004	2010	2020	2030	2050
Total Energy Demand (10 ⁸ TCE)	20	23	30	50	70
Macro-Hydro (GW)	74	115	215	250	500
Annual Production (10 ⁸ KWh)	2300	3900	7300	8750	17500
Equal to (10 ⁸ TCE)	0.82	1.33	2.4	2.71	5.25
Micro-Hydro (GW)	34	50	75	100	200
Annual Production (10 ⁸ KWh)	1000	1545	2300	3200	6400
Equal to (10 ⁸ TCE)	0.36	0.52	0.76	1	1.92
Wind Power (GW)	0.76	5	30	100	400
Annual Production (10 ⁸ KWh)	11.4	105	690	2300	9200
Equal to (10 ⁸ TCE)	0.0041	0.036	0.23	0.76	3.04
Biomass Power (GW)	2	5.5	20	50	100
Annual Production (10 ⁸ KWh)	51.8	212	835	2250	5000
Equal to (10 ⁸ TCE)	0.013	0.072	0.28	0.7	1.5
Biogas (10 ⁸ m3)	50	110	240	400	1000
Equal to (10 ⁸ TCE)	0.036	0.079	0.17	0.3	0.8
Solar Thermal (10 ⁴ m2)	6500	15000	30000	50000	100000
Equal to (10 ⁸ TCE)	0.085	0.2	0.39	0.65	1.3
PV (GW)	0.065	0.3	1.8	10	100
Annual Production (10 ⁸ KWh)	0.78	4.2	21.6	140	1500
Equal to (10 ⁸ TCE)	0.00028	0.0014	0.0071	0.043	0.45
Others (10 ⁸ TCE)	0.029	0.065	0.26	3.837	6.74
Total (10 ⁸ TCE)	1.35 (0.56)	2.3 (0.97)	4.8 (2.4)	10 (7.29)	21 (15.75)
Share of RE (%)	6.5 (3)	10 (4.2)	16 (8)	20 (14.6)	30 (22.5)

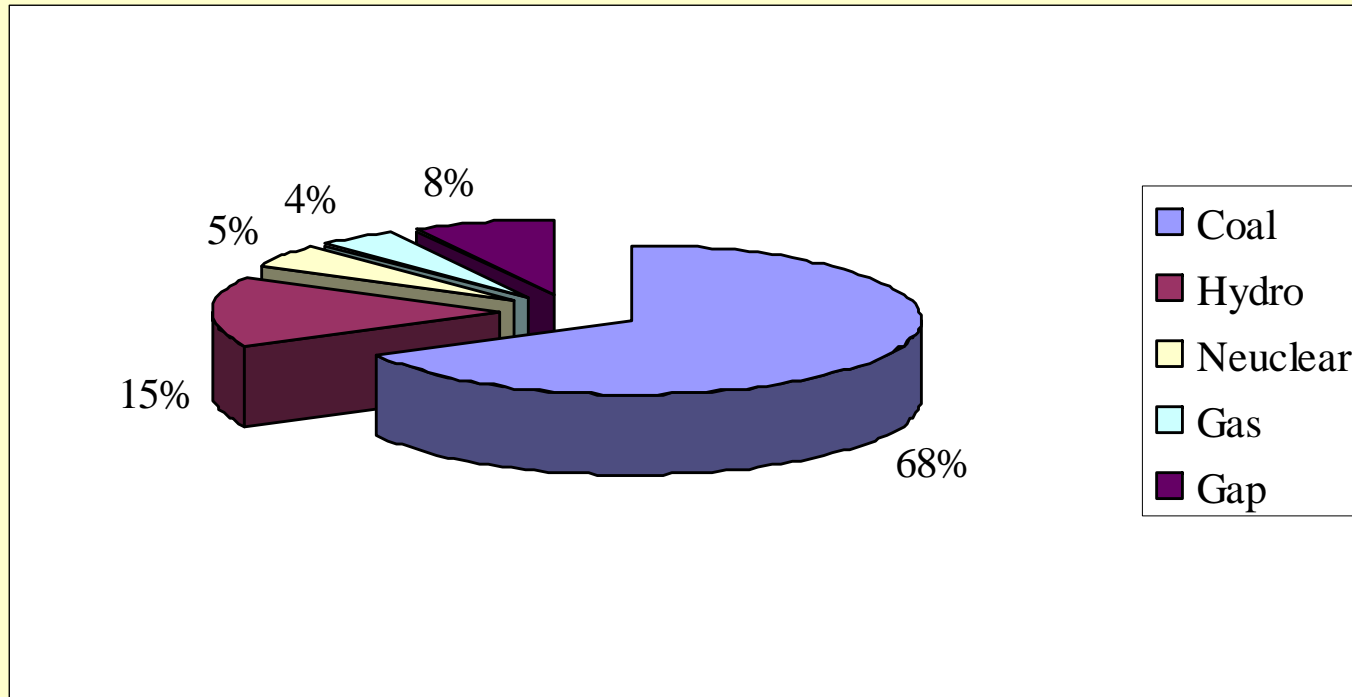
Predictions of Renewable Energy development in China

Installed Power by 2010 in China (CEPRI)



Type	Coal	Hydro	Neuclear	Gas	Gap	Total
2010(GW)	500	100	16.4	15.7	52.9	685
%	73.0	14.6	2.4	2.3	7.7	100.0

Installed Power by 2020 in China (CEPRI)



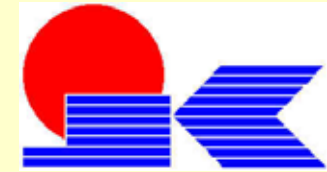
Type	Coal	Hydro	Neuclear	Gas	Gap	Total
2020 (GW)	750	170	53	48	91	1112
%	67.4	15.3	4.8	4.3	8.2	100.0

Expectation of the Share of Electric Power in 2050



(China Electric Power Research Institute)

Power	Capacity (GW)	Share (%)	
Coal	1000	50%	
Nuclear	240	12%	
Gas	100	5%	
Hydropower	160	8%	
Micro-Hydropower	200	10%	RE 25%
Biomass Power	100	5%	
Wind	100	5%	
PV	100	5%	
Total	2000	100%	

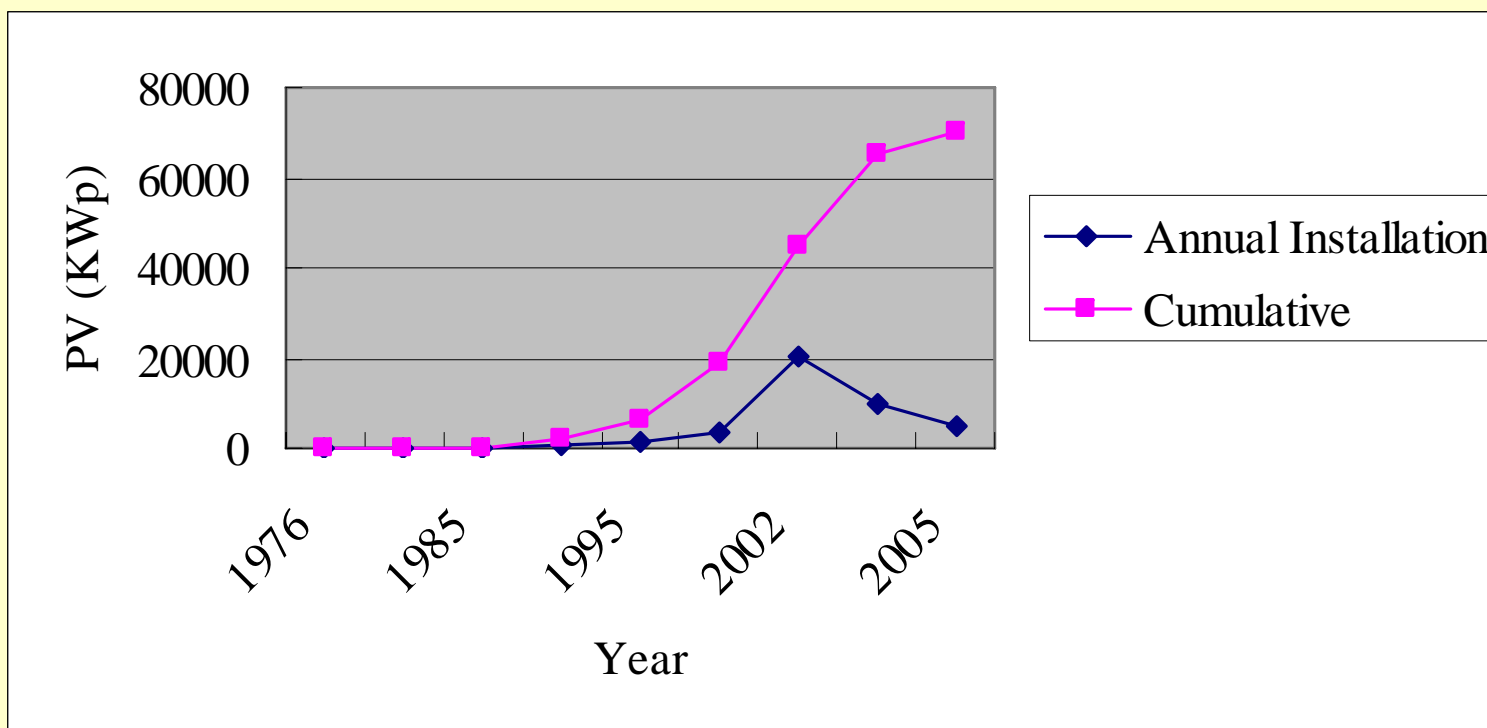


2. PV Market in China



PV Annual Installation and Cumulative

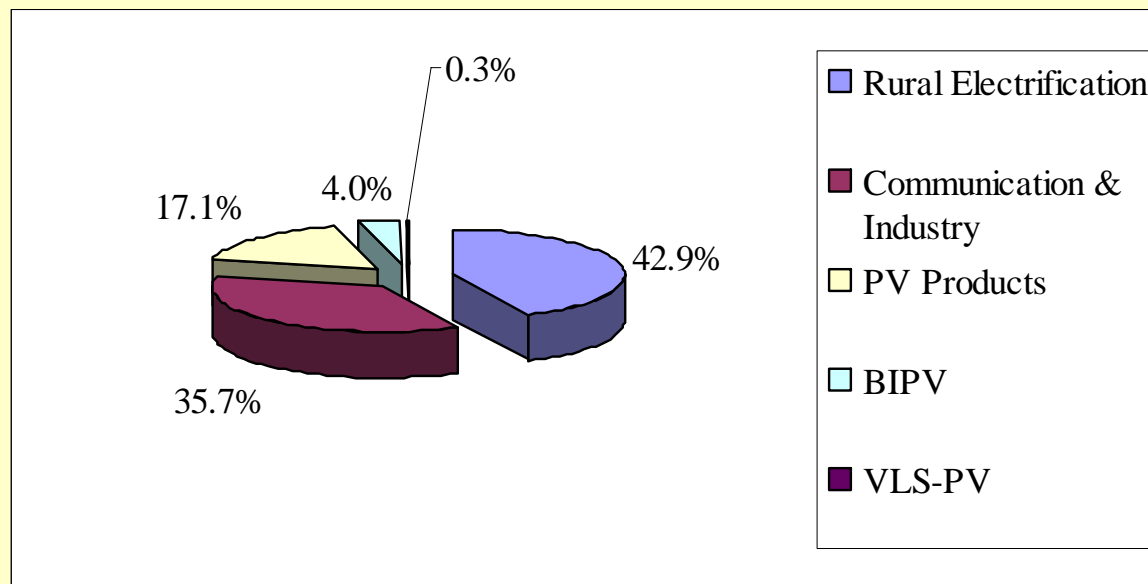
Year	1976	1980	1985	1990	1995	2000	2002	2004	2005
Annual Installation (KW)	0.5	8	70	500	1550	3300	20300	10000	5000
Cumulative (KW)	0.5	16.5	200	1780	6630	19000	45000	65000	70000



PV Market Share in 2005 in China



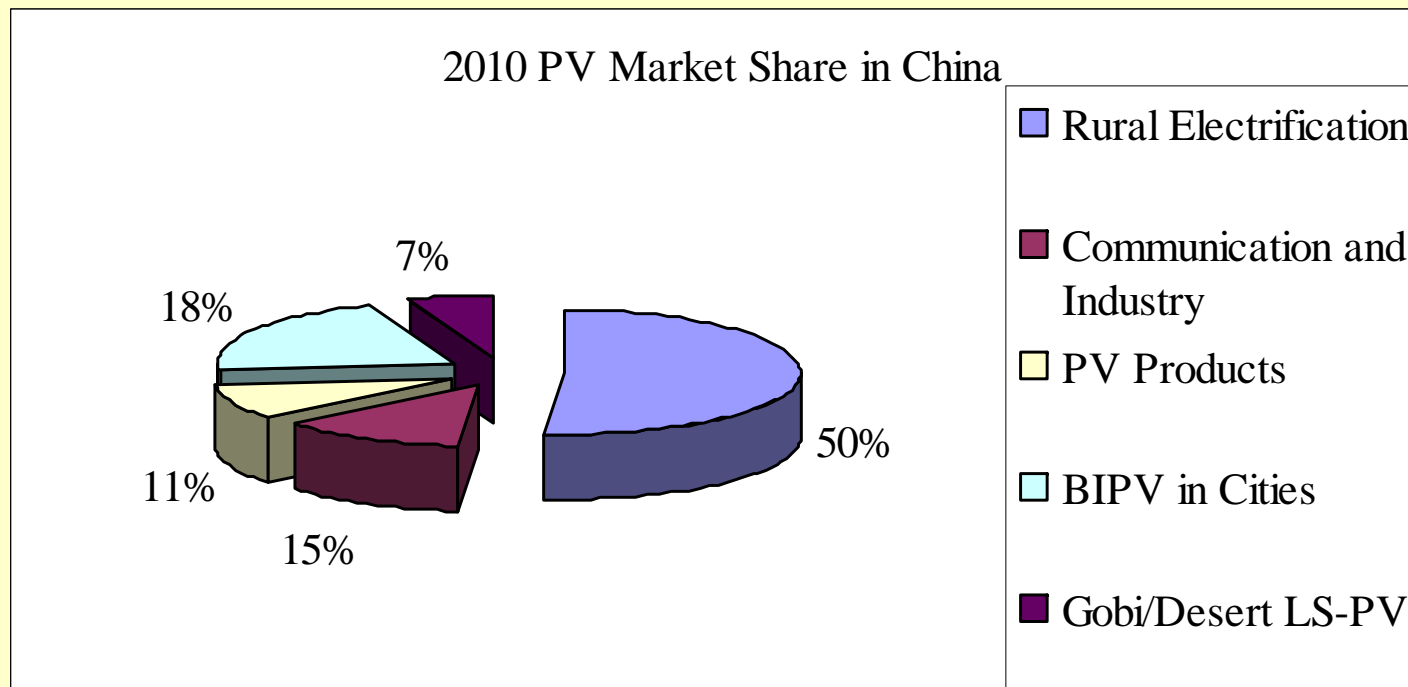
Market Sector	Cumulative (MWp)	Share (%)
Rural Electrification	30	42.9
Communication and Industry	25	35.7
PV Products	12	17.1
BIPV in Cities	2.8	4.0
Gobi/Desert LS-PV	0.2	0.3
Total	70	100



2010 PV Market Expectation in China



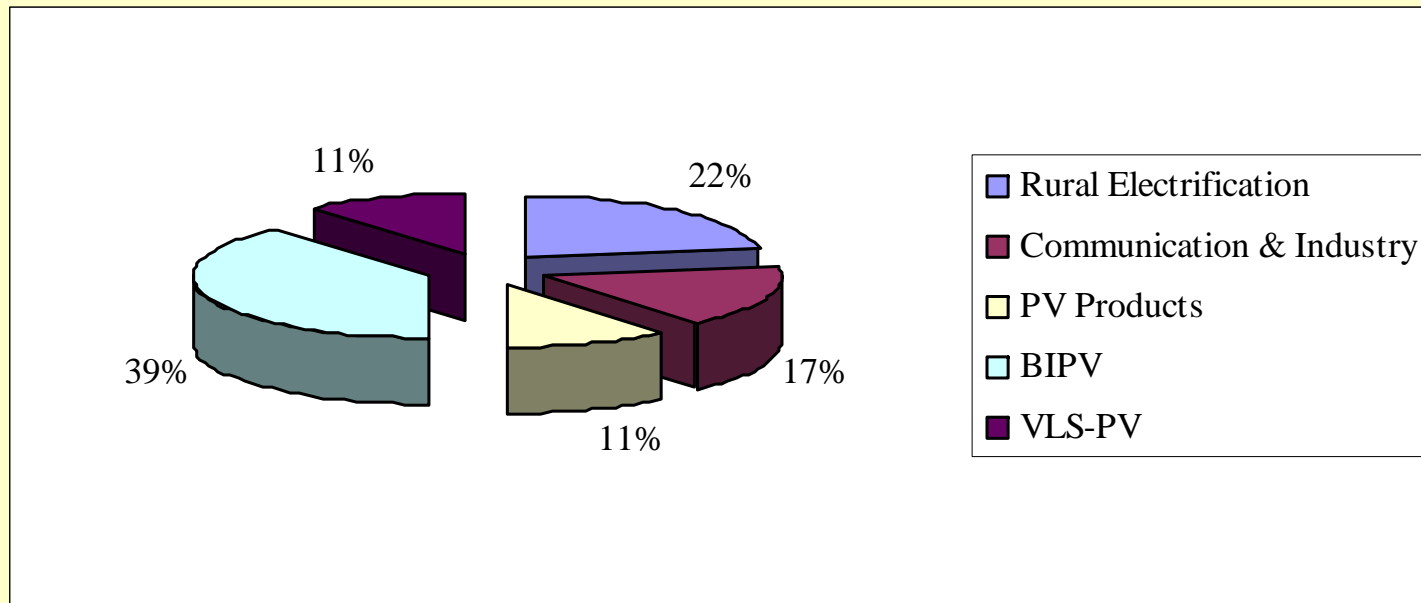
Market Sector	Cumulative (MWp)	Share (%)
Rural Electrification	150	50
Communication and Industry	45	15
PV Products	32	10.7
BIPV in Cities	53	17.6
Gobi/Desert LS-PV	20	6.7
Total	300	100

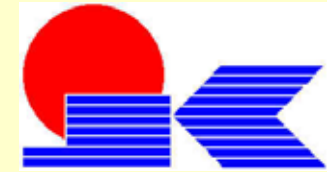


2020 PV Market Expectation in China



Market Sector	Installed PV (MWp)	Market Share (%)
Rural Electrification	400	22
Communication & Industry	300	17
PV Products	200	11
BIPV	700	39
VLS-PV	200	11
Total	1800	100



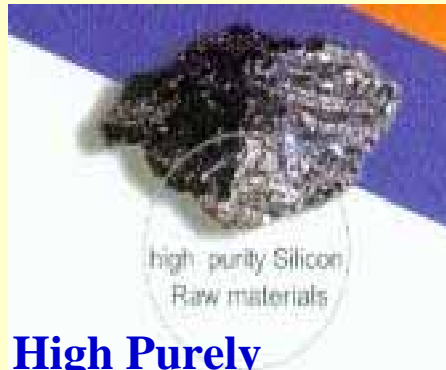


3. PV Industry in China

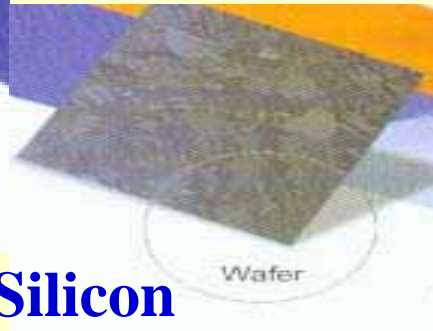
Current Situation of PV Industry in China



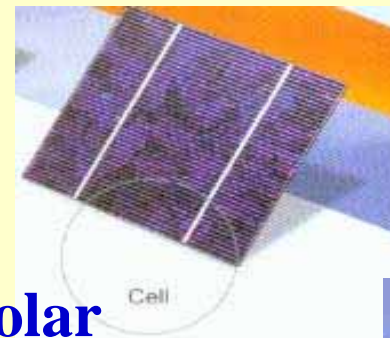
PV Manufacturing Chain



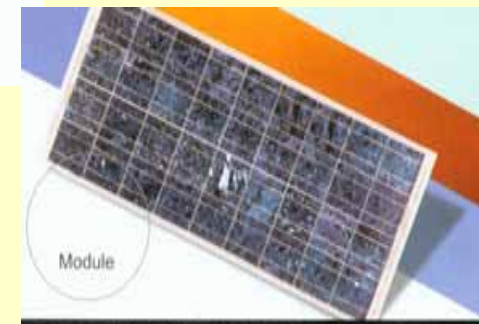
**High Purely
Silicon Raw
Materials**



**Silicon
Wafer**

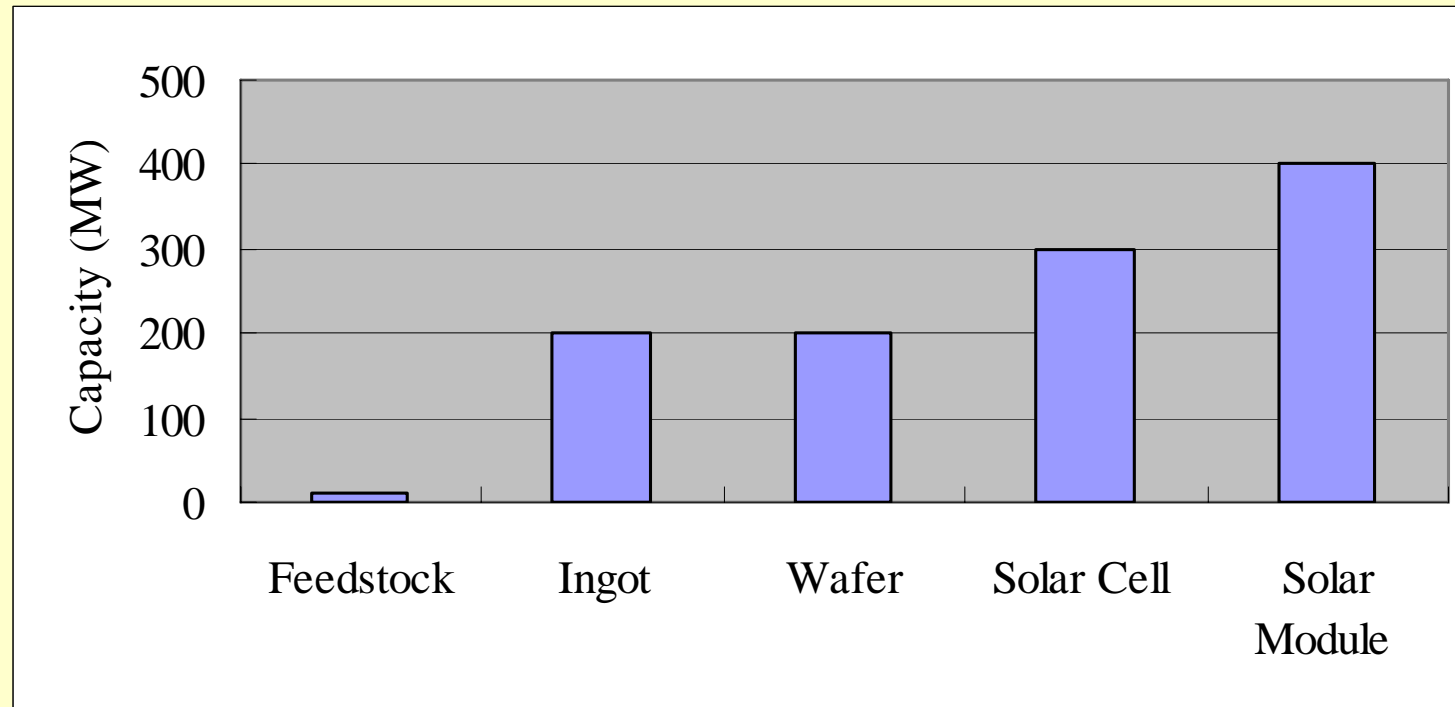
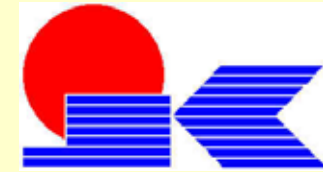


**Solar
Cells**

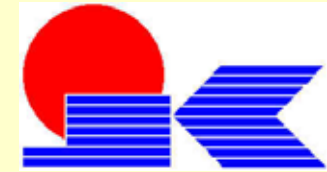


**Solar
Modules**

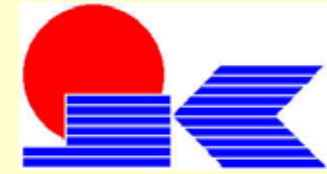
PV Production Chain (2005)



Item	Feedstock	Ingot	Wafer	Solar Cell	Module
Capacity (MW)	12	200	200	300	400



4. PV Application in China



4. Renewable Energy Law

Renewable Energy Law (1)



For Grid-connected PV:

Article 14 — Grid enterprises shall enter into grid connection agreement with renewable power generation enterprises that have legally obtained administrative license or for which filing has been made, and buy the grid-connected power produced with renewable energy within the coverage of their power grid, and provide grid-connection service for the generation of power with renewable energy.

Article 19 — Grid power price of renewable energy power generation projects shall be determined by the price authorities of the State Council in the principle of being beneficial to the development and utilization of renewable energy and being economic and reasonable, where timely adjustment shall be made on the basis of the development of technology for the development and utilization of renewable energy. The price for grid-connected power shall be publicized.

Article 20 — The excess between the expenses that power grid enterprises purchase renewable power on the basis of the price determined in Article 19 hereof and the expenses incurred in the purchase of average power price generated with conventional energy shall be shared in the selling price. Price authorities of the State Council shall prepare specific methods.

Renewable Energy Law (2)



For Off-grid PV:

Article 15 — The Government supports the construction of independent renewable power systems in areas not covered by the power grid to provide power service for local production and living.

Article 22 — For the selling price of power generated from independent renewable energy power system invested or subsidized by the Government, classified selling price of the same area shall be adopted, and the excess between its reasonable operation, management expenses and the selling price shall be shared on the basis of the method as specified in Article 20 hereof.

Implementation Rules for RE Law

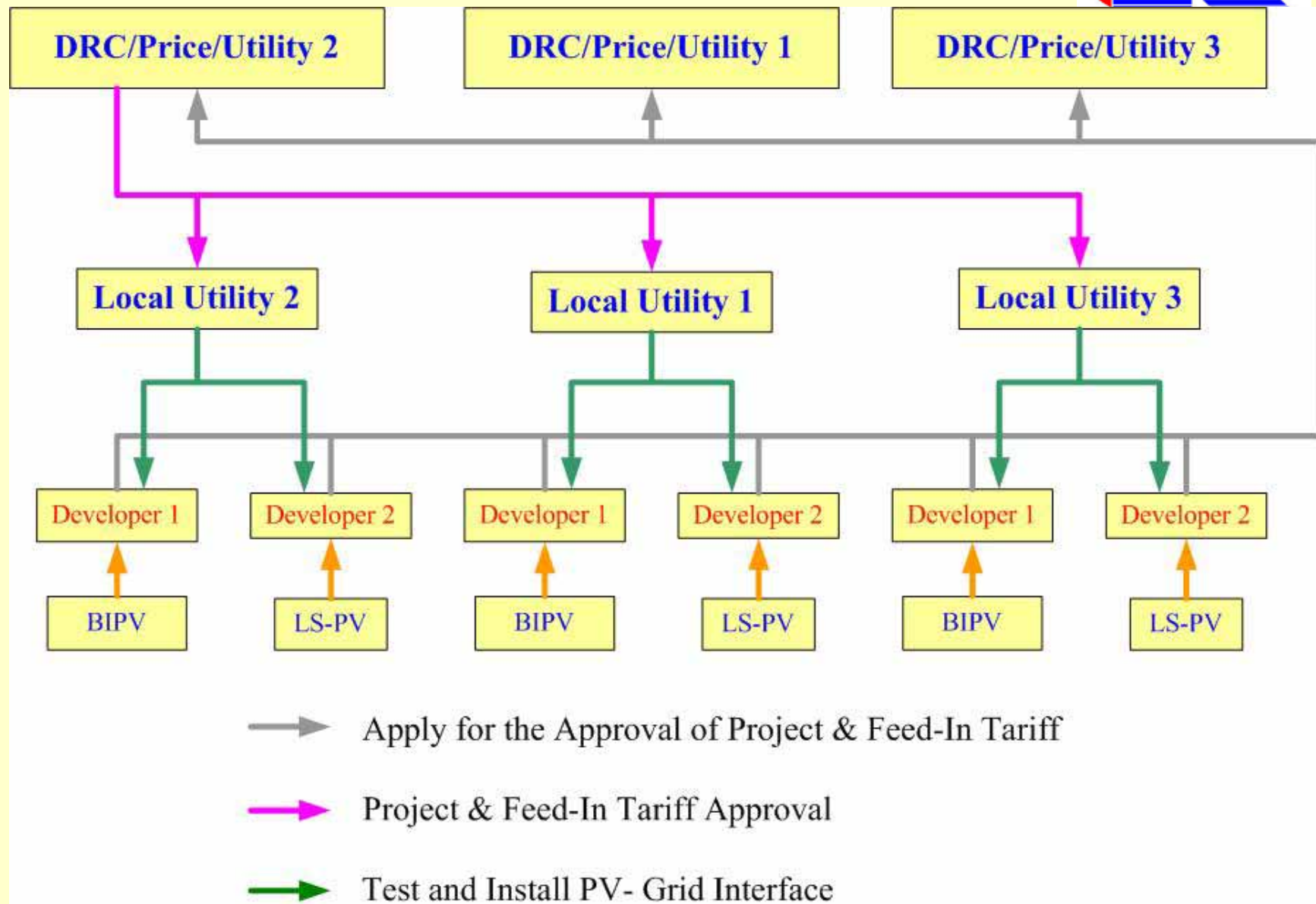


January 4th, 2006, “The Temporary Implementation Rules for Setting up Feed-in Tariff of Renewable Energy Power and the Sharing of Expenses in Purchasing Electricity of Renewable Energy Power” was issued by NDRC.

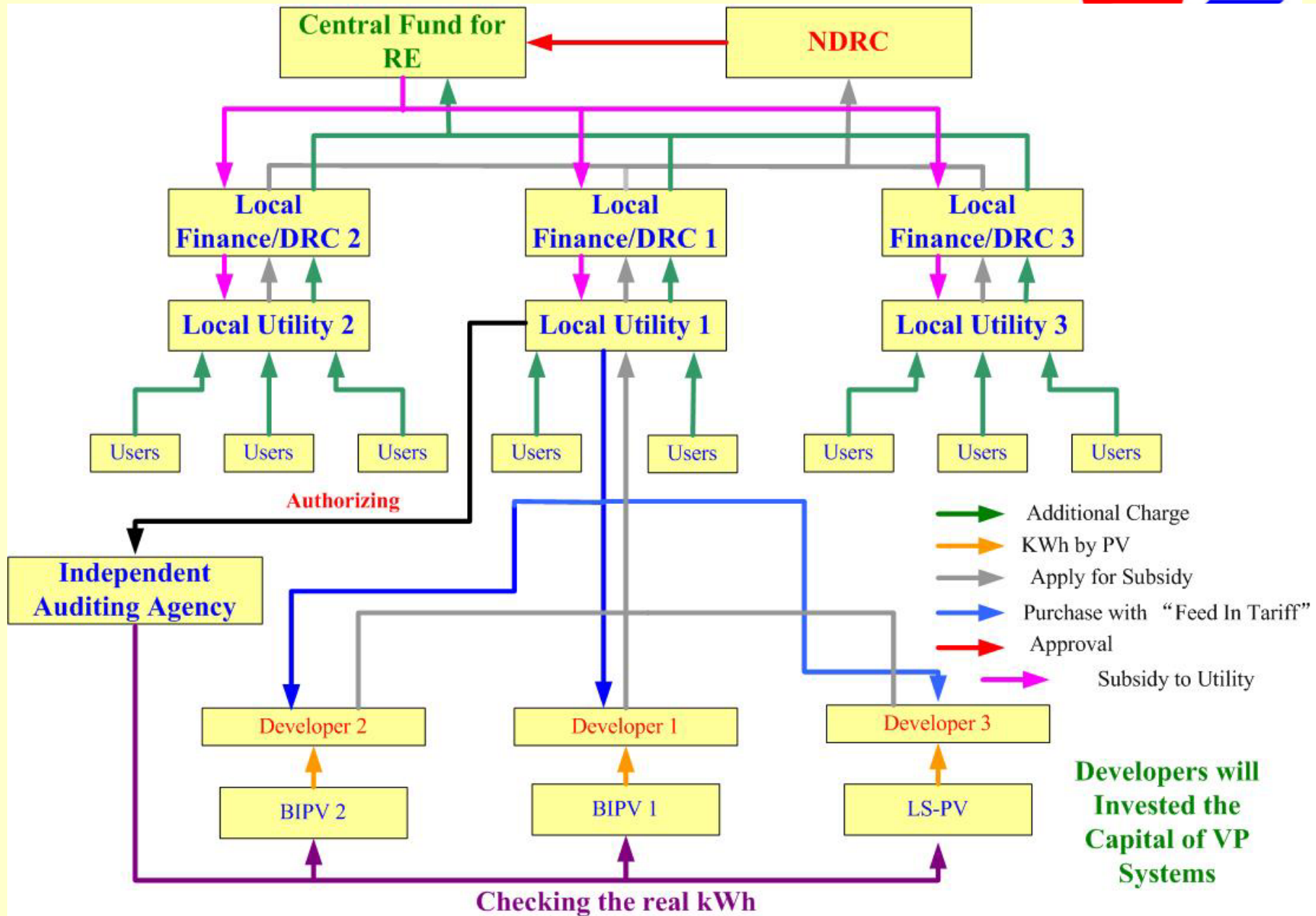
Article 9 — The **feed-in Tariff** for **solar PV**, ocean power and geothermal power generation **will be set** by Government and the principle to set up FIT should be **following the rule of “Reasonable Cost plus Reasonable Profits”** ;

Article 12—The **excess** between the expenses that power grid enterprises purchase renewable energy power and the expenses incurred in the purchase of average power price generated with local conventional fire power ----- **shall be compensated in the way of adding additional charge** to the ordinary selling price of electricity to the whole electricity users in China.

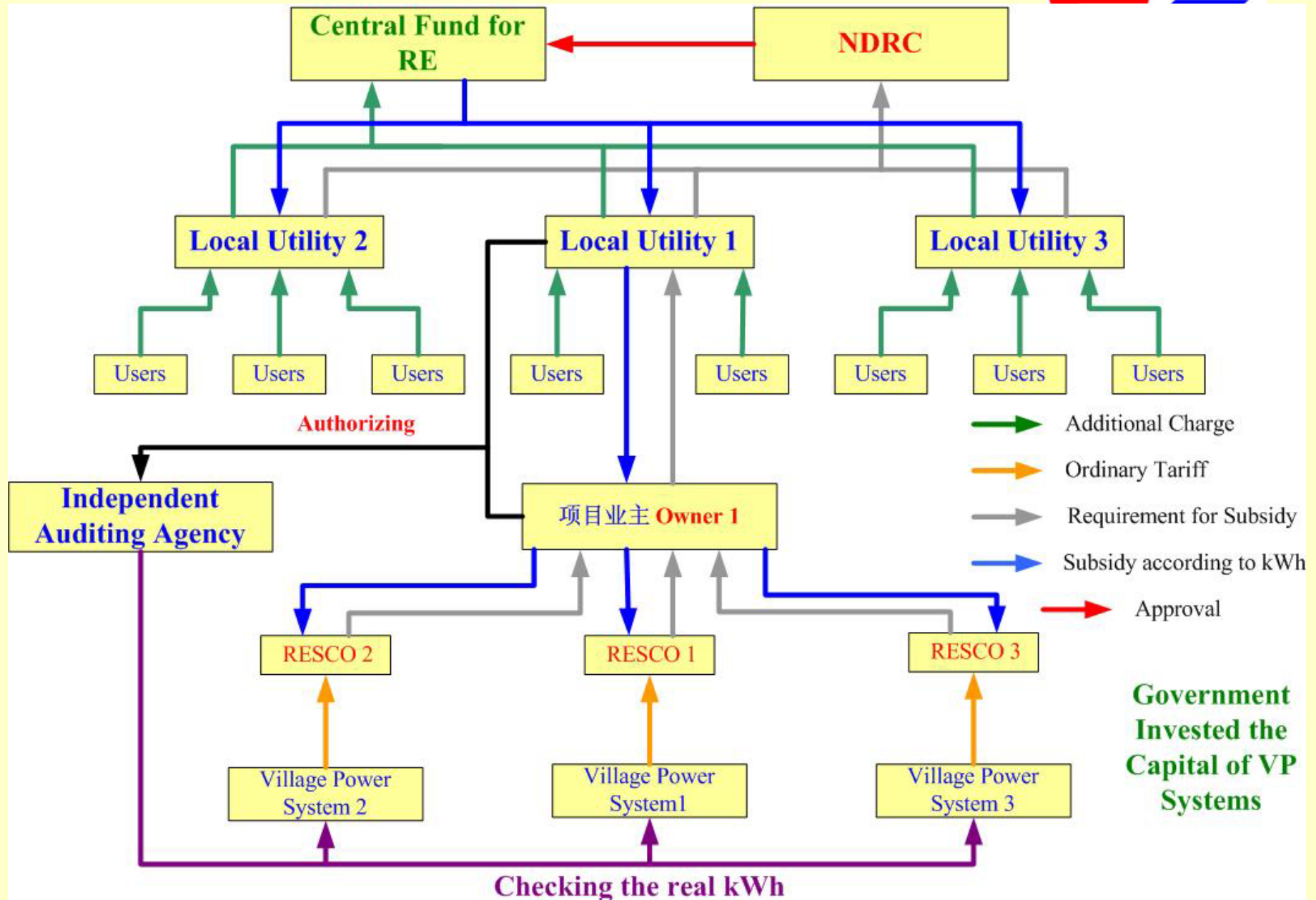
Application and Approval Process

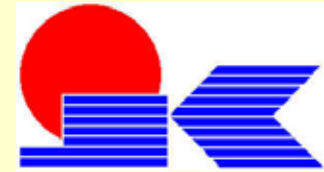


Cash Flow for Grid-Connected PV



Cash Flow for Off-Grid Village PV





5. Conclusion

Challenges and Problems

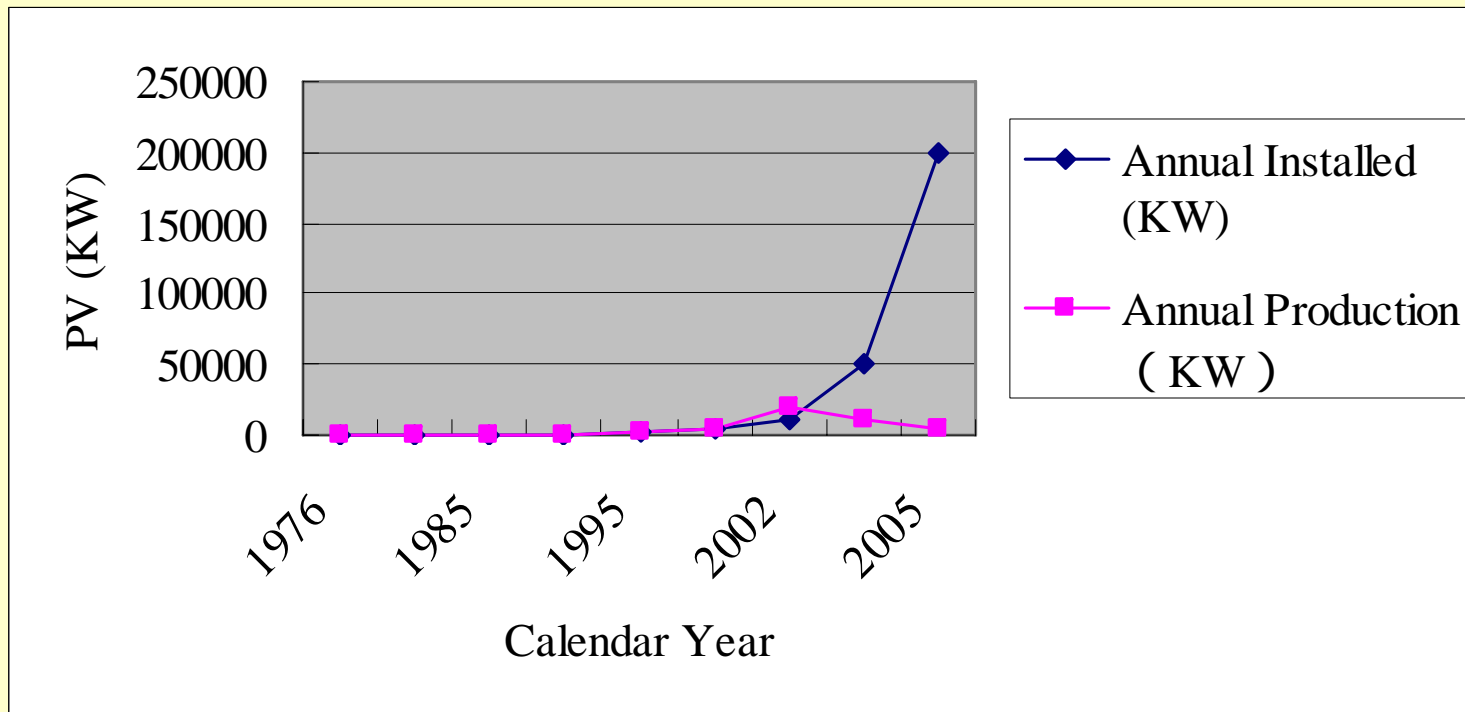


1. Shortage of Si Feedstock (95%进口) ;
2. Whole market is outside (95%以上出口) ;
3. Many Companies still invest into PV and the existing PV companies are expanding. Targets of PV Companies:
Suntech-500MW , Baoding Yingli-500MW , Nanjing PV Tech-600MW , Ningbo-100MW , Trina Solar-100MW , Xian Jiayang (BP)-100MW , Jiangsu Linyang-100MW.....
Totally :**2.0GW**) ;
4. RE Law has been issued, but may face difficulties in implementation ;
5. Cost is too high (50,000 – 100,000 Yuan/KW in capital and 3.5-8.0Yuan/KWh) to become commercial ;
6. **International market is** relay on policy and government subsidy and **not the commercial one**. Once something changed, Chinese PV industry will face troubles.

PV Manufacturing and Domestic Market



Year	1976	1980	1985	1990	1995	2000	2002	2004	2005
Annual Output (KW)	0.5	8	70	500	1550	3300	10000	50000	200000
Annual Demand (KW)	0.5	8	70	500	1550	3300	20300	10000	5000



Conclusions



1. To solve the problem of **shortage of silicon feedstock** by developing domestic silicon feedstock capacity (3000 Tons per year can be expected in 3 years);
2. Promoting **domestic PV market** is the key to balance the huge PV capacity and the market requirement;
3. “RE Law” has not been run on PV and the grid company now refuse PV. It needs to do more efforts in implementation of the law;
4. To meet PV target of 2010 and 2020, **RE Law must be fully implemented** to remove High Cost Barrier -----
Otherwise, Chinese PV will face troubles since the domestic commercial market is too small to support huge PV manufacturing capacity.



**Thank You for Your
Attention!**