The China Sustainable Energy Program

.

.

G-0209-06527

Technical supporting report for China energy efficiency standard of Color TVs

China National Institute of Standardization

2005 3

Technical supporting report for China energy efficiency standard of Color TVs

TCL

RGB

.... 4

.... 6

.... 8

....................11

.... 11
.... 13
.... 17
.... 20

.... 22

.... 22
.... 24
.... 25
.... 26

.... 28

.... 28
1 28
2 38
.... 40
1 41
2 42
3 43
4 44
5 45

.... 48

.... 48
.... 49
.... 49

.... 51

.... 52
.... 57

.... 60

.... 62

.... 66

.... 66

.... 66

.... 68

.... 70

1 .... *70*

2 .... *72*

3 .... *73*

.... 76

.... 76

1 .... *76*

2 .... *77*

.... 78

1 .... *79*

2 .... *80*

3 .... *82*

4 .... *84*

.... 87

.... 94

.... 96

1 .... *96*

2 .... *97*

.... 98

.... 98

.... 99

1 .... *100*

2 .... *100*

3 .... *101*

4 .... *101*

5 .... *101*

6 .... *103*

7 .... *105*

8 .... *106*
9 .... *106*
10. .... *106*
.... 108
.... 112
..115

0 – 1 18
2 – 1 " TOP RUNNER " 29
2 – 2 1998 30
2 – 3 31
2 – 4 35
2 – 5 35
2 – 6 36
2 – 7 37
2 – 8 40
2 – 9 GB12021.7-1989 41
2 – 10 GB/T 10239-1994 43
4 – 1 53
4 – 2 1999 2002 58
4 – 3 1999 2002 60
5 – 1 CRT 67
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5 – 3 69
5 – 4 69
5 – 5 CRT 70
5 – 6 PDP,LCD 71
6 – 1 79
6 – 2 W........ 80
6 – 3 W........ 80
6 – 4 81
6 – 5 81
6 – 6 82
6 – 7 83
6 – 8 2002 /KWH 85
6 – 9 89
6 – 10 90
7 – 1 2005 2014 100
7 – 2 2005 2014 100
7 – 3 102

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7－4 103

7－5 106

7－6 CO_2 KG-C/KGCE 107

7－7 CO_2 *A* G-C/KWH 108

1-1 ... 22
1-2 PAL ... 25
4-1 1990 2000 ... 51
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6-9 14 ... 94
6-10 ... 95
6-11 29 ... 96
6-12 (34) ... 97
7-1 2005 2014 ... 104
7-2 ... 104
7-3 ... 105
7-4 2005 2014 ... 105
7-5 2005 2014 ... 110
7-6 2005 2014 ... 110

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7-7 2005 2014 C 111
7-8 2005 2014 111
7-9 2005 2014 111
7-10 2005 2014 112

1989 GB12021.7

1990

GB12021.7-1989

3

2002 12 2004 5 G-0209-06527

TCL

RGB

LBNL

31

.

.

20 80

2002

126.4 [1] 2

30.9 3

4.9

2001

54.4

2002 60.5 [1] 2002

2.8

1

2

3

2001 329 12.4

1998 1

1

1989 GB12021.7

1990

37cm 56cm 31cm 47cm

80

20

2002

20020405-Q-424

2002 12

G-0209-06527

TCL

RGB

100

1

2003 7 18

“ ”

TCL

1

CRT CRT

2

3

4 9W

3W 1.2 GEEA 2008 ( )

6W 1W

0.75 GEEA

2003 12 4

TC100

TCL

22 30

2

1

CRT

2 9W 1.5

3 3W 1.1

4 5W 1

1W 0.75

5

6

7

2003 12

54 2004 3 5 7

34 3 22 1 7

1 29

2 “ ” 3

3 1

4 1

5 4

6 2

2004 4 9

20 10 30

1 “ ” “ ” “ ”

“ ”

2 3.8

3 1 2

4 4.2.3 4.3.2 6.2

5 C

2004 5

2005 2014 10

377.2 200 C

9.81M NOx 15 SO_2 200

94 21.6

11.5 C 0.56M NOx 0.86

SO_2 11.4 5.4

0-1

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0 – 1

			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	billion kWh	37.72	0.16	0.53	1.16	2.08	3.04	4.03	5.06	6.12	7.22	8.30
	billion kWh	2.16	0.01	0.03	0.07	0.12	0.17	0.23	0.29	0.35	0.41	0.48
	billion kWh	35.56	0.15	0.49	1.10	1.97	2.87	3.80	4.77	5.78	6.81	7.82
	billion yuan	20.02	0.07	0.25	0.56	1.03	1.53	2.07	2.65	3.28	3.94	4.62
	billion yuan	1.15	0.00	0.02	0.03	0.06	0.09	0.12	0.15	0.19	0.23	0.27
	billion yuan	18.88	0.07	0.23	0.53	0.97	1.45	1.96	2.50	3.09	3.72	4.36
	MtC	9.81	0.04	0.14	0.30	0.54	0.79	1.05	1.32	1.59	1.88	2.16
	MtC	0.56	0.00	0.01	0.02	0.03	0.04	0.06	0.07	0.09	0.11	0.13
	MtC	9.25	0.04	0.13	0.28	0.51	0.75	0.99	1.24	1.50	1.77	2.03
NOx	ktNOx	150.86	0.64	2.11	4.66	8.34	12.16	16.12	20.24	24.49	28.89	33.22
	ktNOx	8.63	0.04	0.13	0.28	0.47	0.68	0.91	1.14	1.39	1.65	1.93
	ktNOx	142.23	0.59	1.97	4.38	7.86	11.47	15.22	19.09	23.10	27.24	31.29
SO2	ktSO2	1998.90	8.42	27.93	61.74	110.46	161.10	213.65	268.12	324.51	382.83	440.14

.

			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	ktSO3	114.33	0.56	1.77	3.67	6.28	9.06	12.01	15.13	18.42	21.89	25.54
	ktSO4	1884.57	7.87	26.16	58.07	104.18	152.04	201.64	252.99	306.09	360.93	414.60
	ktParticulates	942.88	3.97	13.18	29.12	52.10	75.99	100.78	126.47	153.07	180.58	207.61
	ktParticulates	53.93	0.26	0.84	1.73	2.96	4.27	5.66	7.13	8.69	10.33	12.05
	ktParticulates	888.95	3.71	12.34	27.39	49.14	71.72	95.11	119.34	144.38	170.25	195.57

1

2

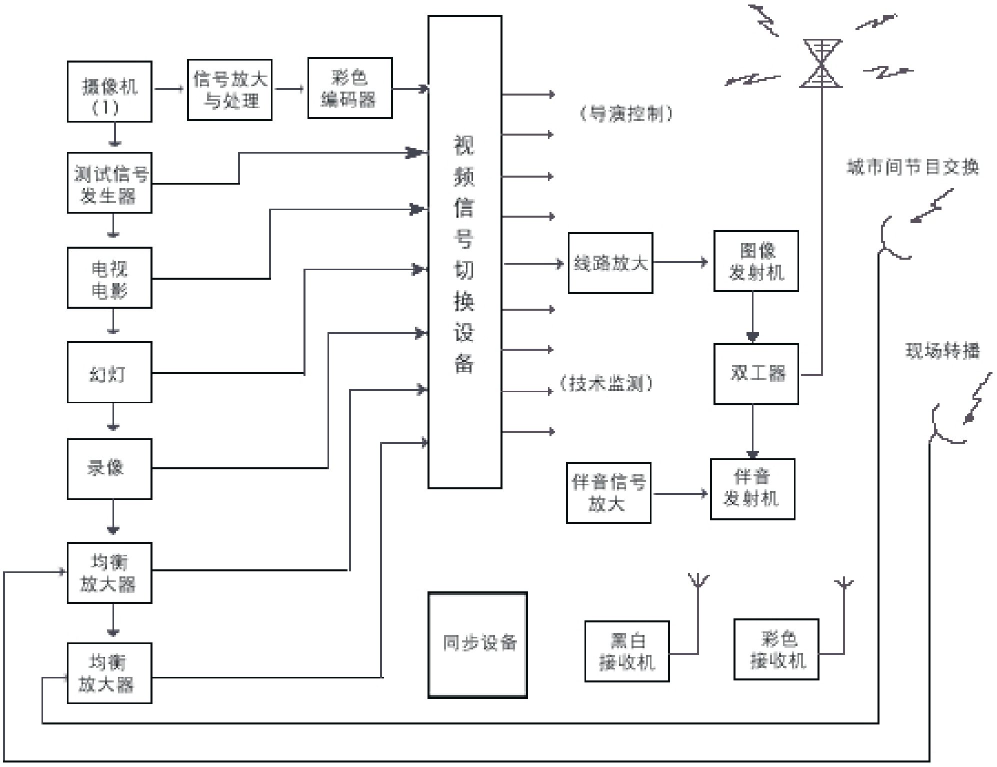
3

4

.

5

1-1



摄像机
（1）
信号放大
与处理
彩色
编码器
测试信号
发生器
电视
电影
幻灯
录像
均衡
放大器
均衡
放大器
视
频
信
号
切
换
设
备
（导演控制）
（技术监测）
线路放大
图像
发射机
双工器
伴音信号
放大
伴音
发射机
城市间节目交换
现场转播
同步设备
黑白
接收机
彩色
接收机

广播电视系统组成方框图

1-1

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20

20

NTSC PAL SECAM

20

ATSC/VSB DVB/OFDM ISDB-T

MPEG-2

GB/T9002-1996

CRT

FPD Flat Panel Display

1/4

X

HDTV FPD LCD

PDP FED Field Emissiou Display

OELD CRT

CRT FPCRT

CRT

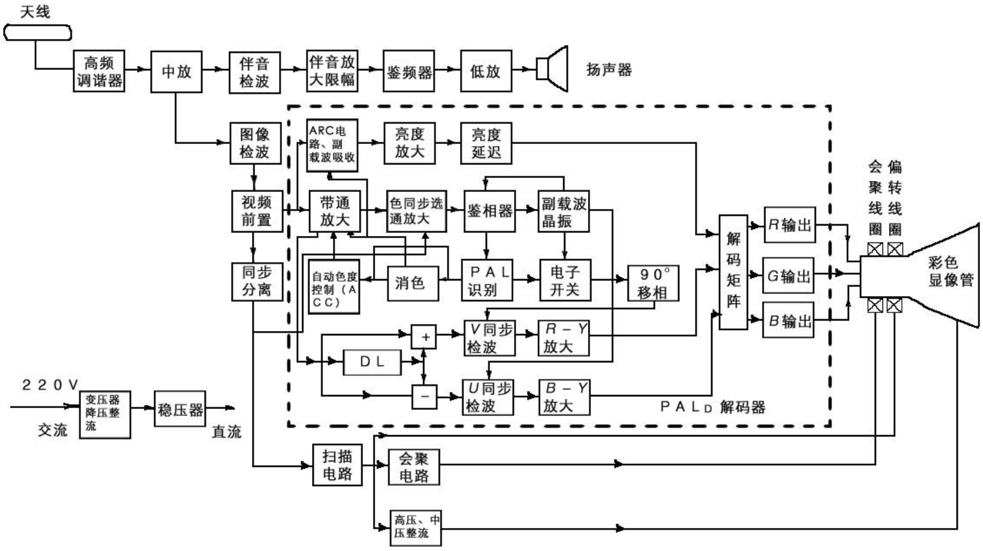
4:3 16:9

CRT LCD PDP

FED OELD

7000

1-2 PAL


天线
高频调谐器
中放
伴音检波
伴音放大限幅
鉴频器
低放
扬声器
图像检波
视频前置
同步分离
ARC电路、副载波吸收
亮度放大
亮度延迟
带通放大
色同步选通放大
鉴相器
副载波晶振
自动色度控制（ACC）
消色
PAL识别
电子开关
90°移相
DL
+
−
V同步检波
U同步检波
R − Y放大
B − Y放大
解码矩阵
R输出
G输出
B输出
会聚线圈
偏转线圈
彩色显像管
$\mathrm{PAL_D}$ 解码器
220V
交流
变压器降压整流
稳压器
直流
扫描电路
会聚电路
高压、中压整流

$\mathrm{PAL_D}$制彩色电视机方框图

1-2 PAL

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ACC ACK

1

2

3

4

5

6

7

8	AV
9	AV
10	

70

1

30

150000MW 7000 700 000GWh

1979

MITI 1979

“ ”

1979 1994

1998 6 1999 4

Top Runner

2

1 “Top Runner”

1999 3

9.7Mt 1995 “ ”

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2－1 “Top Runner”

	63.0	2004
	14.0	2007
	22.5	2004
	16.4	2003
	58.7	2003

	16.6	2005
	83.0	2005
Magnetic disk drives	78.0	2005
Photocopier	30.0	2006

Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies Main Report November 1999

1994 4

1. 53cm(21inch)
2. 53cm(21”)
3.
4. HDTV .

2 2 1998

2–2 1998

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	kWh/yr.
53cm(21”)	6.24S+14.5+A
53cm(21”)	6.24S+34.2+B
	7.06S+53.9+B
HDTV	9.86S+99.4

Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies Main Report November 1999

S=

A=16.4 for built-in broadcast satellite reception

44.6 for built-in video deck

61.0 for built-in satellite reception and video deck

0.0 otherwise

B=44.6(for built-in video deck)

0.0(otherwise)

1999 3 31 192 Top Runner 1999

2003 2 3

2 – 3

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				kWh/year
	4 3	100		$E_M=2.5S+32$
			VCR	$E_M=2.5S+60$
		100		$E_M=5.1S-4$
			VCR	$E_M=5.1S+24$
	16:9 ( )			$E_M=5.1S-11$
			VCR	$E_M=5.1S+17$
			VCR	$E_M=5.1S+6$
			VCR	$E_M=5.1S+13$
			VCR	$E_M=5.1S+59$
	16 9			$E_M=5.5S+72$
				$E_M=5.5S+41$

Notification No.192 of the Ministry of International Trade and Industry

1 2003 4 2004 3

2

MUSE-NTSC

3 S 2.54

E_M Wh 2 1

$$E_M=\{(P_0-P_A/4)\times1642.5+P_S\times7117.5\}/1000 \qquad 2\ 1$$

P_0—— W

P_A—— W

P_S—— W

t_1—— 4.5 h

t_2—— 19.5 h

JIS C6101

Group for Energy Efficient Appliances GEEA)

1996 3

European

Energy Network, EnR

E2000 GEEA GEEA

✓

European Information,

Communications and Consumer Electronics Technology Industry

Association EICTA

✓ 25

✓

✓

2001 1 GEEA

NOVEM 102

✓

✓

✓ /

✓ SMPS

2 2

$$E_i = \frac{E}{E_R}$$ 2-2

E—— KWh

E_R—— KWh

E_i——

E_R

24 2-3 2-4

$$E_{24hrsR} = \sum_{i=1}^{n} P_{i.R} \times t_{i,R}$$ 2-3

$$\sum t_{i.R} = 24hours \qquad 2\text{-}4$$

$t_{i,R}$

E E_R

Pi

E_{24hrs} 2-5

$$E_{24hrs} = \sum_{i=1}^{n} P_i \times t_{i,R} \qquad 2\text{-}5$$

2-1 GEEA

- ✓ P_{on} $t_{on,R}$ /

- ✓ P_{sbp} $t_{sbp,R}$

“ ” “ ” “

”

- ✓ P_{sba} $t_{sba,R}$

- ✓

$P_{i,R}$ 2-4

2－4

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	W		W	
	4*	4	6	6
	0	12	0	12
	0	0	0	0

GEEA Working Group on Consumer Electronics Criteria for TVs(duty cycle):analogue and digital broadcasting,January 18,2001

2-6

$$P_{on,R} = \frac{P_{basis} + P_{digital} + P_{sb,audio} + P_{dcoder}}{\eta_{power\sup ply}} + \frac{\alpha_{screen} \times [0.80;0.87]_{ws0:1} \times scrnsize + \alpha_{tube} \times scrnarea + \Delta_{scanrate}}{\eta_{smps}}$$

(2-6)

$P_{on.R}$

-
- 4 3 16 9
- dm^2 :
- 50Hz 100Hz
-
-

2-6 2-5

2－5

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η power supply		0.75

.

η_{SMPS}		0.825
P_{baiss}		6W
$P_{digital}$		9W[1]
$P_{sb,audio}$		6W
$P_{decoder}$		12W[2]
α_{tube}		0.38W/dm[2]
α_{screen}		0.75W/cm
$\Delta_{scanrate}$	100Hz	23W[3]

GEEA Working Group on Consumer Electronics Criteria for TVs(duty cycle):analogue and digital broadcasting,January 18,2001

1 9W 0

2 12W 0

3 100Hz 23W 0

$t_{i,R}$ 2-6

2 – 6

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	h/day		h/day	
	4*	4	4	4
	0	10	0	2
	20	10	4	2
	0	0	16	16

GEEA Working Group on Consumer Electronics Criteria for TVs(duty cycle):analogue and digital broadcasting,January 18,2001

GEEA E1,GEEA 0.75.

.

GEEA

25

GEEA 102

70

10

30

GOSTANDART(

GOST) ZNEENMash(GOST

) GOSTANDART GOST

Mintopenergo,

GOST18198-89

2-7

2—7

	cm	W	
	67	80	
	61	80	50
	51 40	60	40
	44 40	70	40
	32	60	
	31		35/22

	25	50	
	23		30/20
	16		18/8

using an autonomous power supply

GOST 18198-89

2

30

ISDN

IEA

OECD 1.5%

OECD 2.2%[2]

1999 2001

2000

2000 2001 4

157

37 /

.

3W

75%

“

/

“ ” / ”

2-8

2－8

Swiss Energy 2000	Energy Star	Group for Efficient Appliances(GEEA)( )	Blauer Engel ( )	Nordic Swan ( )
≤3W	≤3W	≤1W	≤4W	≤1W 100Hz 3W

IEA Benoit Lebot 2001 11 “
”

Top-runner 2003 1W
1995 1996
16 2000
6W 2009
3W 2000 1 1
10W
energy star

3W 2002 7 1 2002
7 1 2005 6 30 1W
3W 2005 7 1
1W
2010 1W

1

1989 12 1990 12 1 GB12021.7-1989

37cm 56cm 31cm 47cm

2-9

2－9 GB12021.7-1989

	cm	W	W
	37	1	55
	41	1	55
	47	1.5	60
	51	1.5	60
	56	2	75
	31	0.5	30
	35	0.5	30
	44	0.5	40
	47	0.5	60

GB 12021.7-1989

4.3

GB12021.7

7000

1/10

2

3C

China Compulsory Certification

GB 8898-2001

IEC60065

GB 13836 200 2

IEC 60728-1

GB 13837-2003

IEC

CISPR 13

GB 17625.1-2003

≤16A IEC 61000.3-2

CNCA-01C-017:2001

GB 8898 GB

13836 GB 13837 GB 17625.1

3

CRT GB/T 10239-1994

1994 12 1995 8 1

37cm CRT

38

2-10

2－10 GB/T 10239-1994

cm	W	W
37~44	≥1.0	≤60
47~51	≥1.5	≤65
54~56	≥2.0	≤70
56		

GB/T 10239-1994

2-9 2-10 GB/T 10239-1994

GB 12021.7 1989 GB/T 10239 1994

2002

GB/T10239 1994

2003

SJ/T11285 2003

“ ” “

” “ /

”

4

GB/T 17309.1 1998

1

IEC60107-1

1995 “

”

1W

5

14

- ✓ GB/T1.1-2000
- ✓ GB 8898-2001

GB/T10239 2003

- ✓
- ✓

3

CRT(　　　　)　　LCD　　　PDP

CRT

GEEA IEC/ISO

2003 7

GEEA

GB/T10239 2003

GB/T10239

GB/T10239 GB8898

GB/T10239

Novem

10%

(SMPS)

SMPS SMPS 80% 86% SMPS

90 SMPS

N27

1W 6W 5W RF 0.1W

1.7W 1.6W

5W 7W [3]

SMPS

50 65

DVD CD-ROM

80cd/ｍ^2

180 cd/ｍ^2 300

cd/ｍ^2

.

Novem

230 cd/m^2 130 cd/m^2 10%

3

100

2000 57

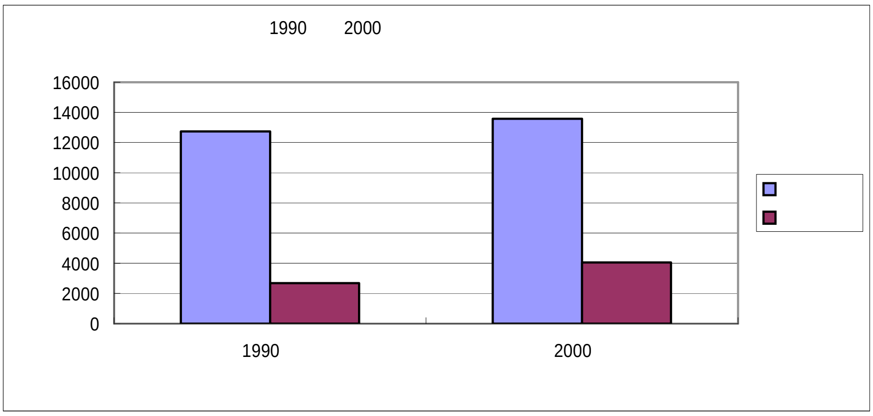
32 30 11 11

[4]

2000

1.36 4051

29.8%[5] 4-1 1990 2000

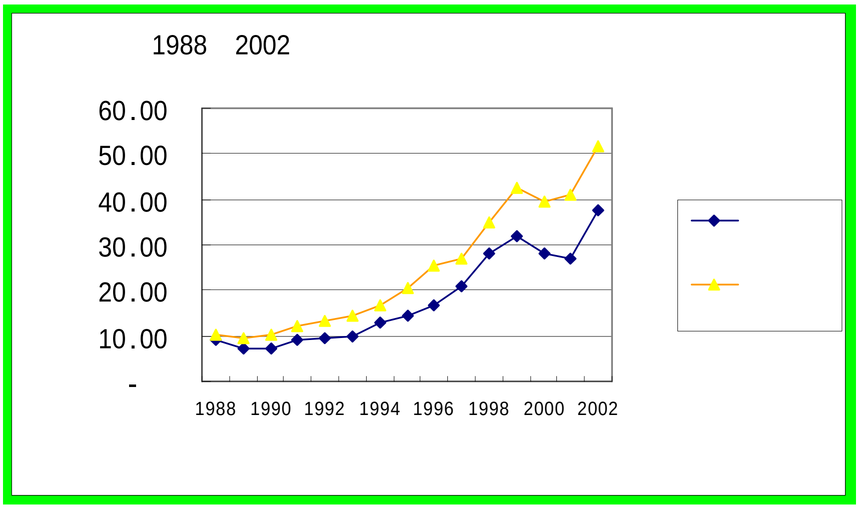


4-1 1990 2000

2003

“ ” 1980—1990 500 1991—1995 1500 1996—2000 3000

14 “ ” “ ” “ TCL ” “ ” “ ” “ ” “ ” “ ” 60 4-2



4-2 1988 2002

CCID

20 “

”

“ ”

2001 68

4-1

4 – 1

	TCL RGB

280 6000

650

( ) 26%

30 [6]

20

1.

2.

3. 1989 -2001 21.5%

1993 -2001 TCL

40.8% 68.2% 42.9%

4. 1995 98 4

100 1998 91 2001

68 100 10 2800

70.9% 634.5

50 100 8

2001 5 —— TCL

57.3%

5. 1989 179 1995

-1999 400 2000 1000

2001 1166 2002 1612

1/3 [6]

6.

3%

30%

12

7.

90

GSM 13 6

8.

20

1.

80 90

“ ” 1993

“ ”

2.

3. 30

4. 20

- -

IC

5. 80

6.

20

1996

1996 3 10

1997

2001

2002

2002 21 1969

38.6 21 29

1274 25% 2001

34

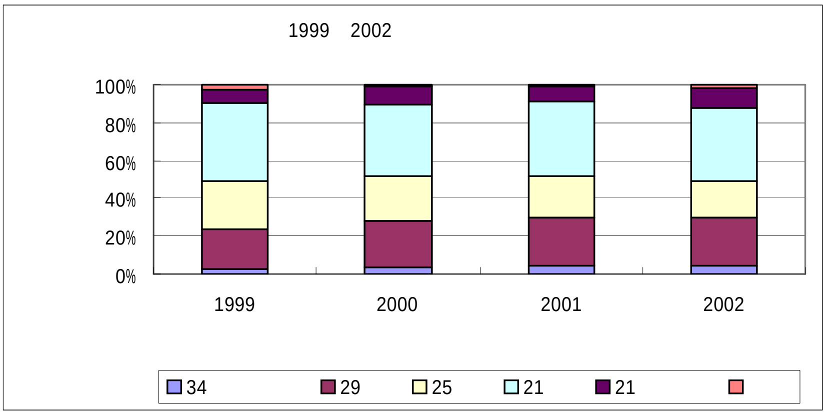
4-2 4-2 4-3 1999

2002

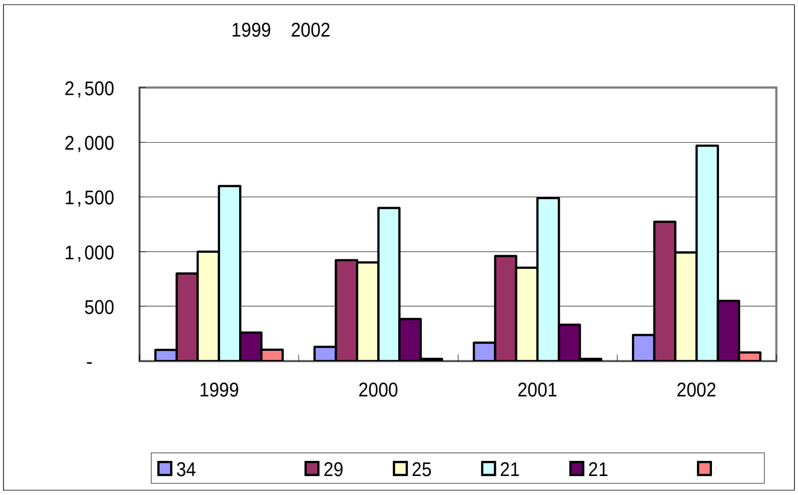
4 – 2 1999 2002

	1999		2000		2001		2002	
34	100	2.6%	130	3.5%	168	4.4%	238	4.7%
29	800	20.7%	920	24.5%	959	25.1%	1,274	25.0%
25	1,000	25.9%	900	24.0%	852	22.3%	992	19.5%
21	1,600	41.4%	1,400	37.3%	1,490	39.0%	1,969	38.6%
21	260	6.7%	384	10.2%	332	8.7%	549	10.8%
	103	2.7%	20	0.5%	19	0.5%	78	1.5%

1999 2001 CCID 2002



4-3 1999 2002



4-4 1999 2002

1999 2002

1. 29 34
34

2. 25
25

3.
“ ”
21
40

4.

2002 5354 1612

3742 21

1580 38.6 29 25

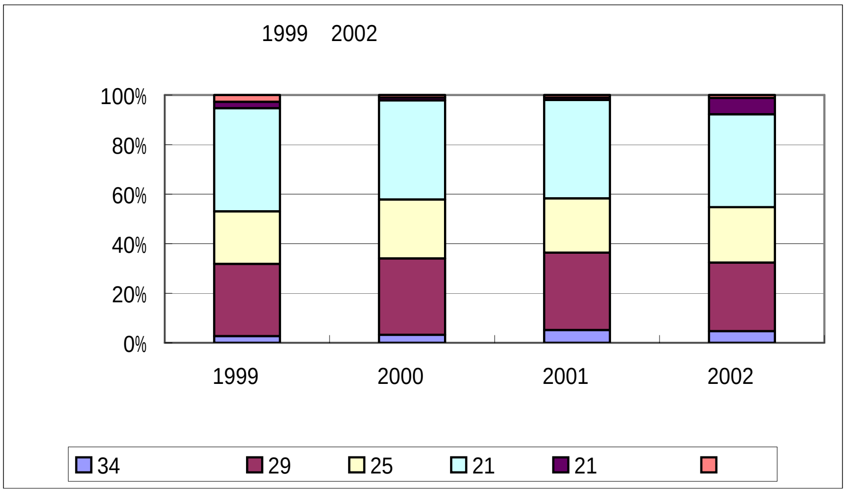
34

4-3 4-5 4-6 1999 2002

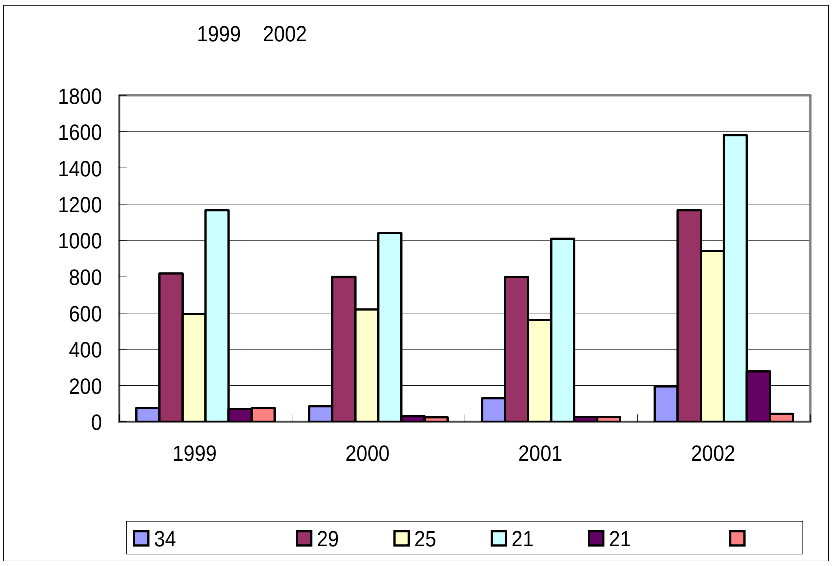
4－3 1999 2002

	1999		2000		2001		2002	
34	76	2.7%	85	3.3%	130	5.1%	196	5.2
29	817	29.2%	800	30.8%	798	31.3%	1167	31.2%
25	595	21.3%	620	23.8%	561	22%	941	25.1%
21	1167	41.7%	1040	40%	1010	39.6%	1580	42.2%
21	70	2.5%	30	1.2%	26	1.0%	278	7.4%
	76	2.7%	25	0.9%	26	1.0%	45	1.2%

1999 2001 CCID 2002



4-5 1999 2002



4-6 1999 2002

1999 2002

2002 2001

1996~1999 PDP

CRT

99% 21

29 25

1.

1000

2. 5

20

1999 5

25.73

3. 2010

70 2

10 1.3

20 300

1.

1975 1975

1985 12

700 2000 25

12

350

2.

80

2001

10 3000

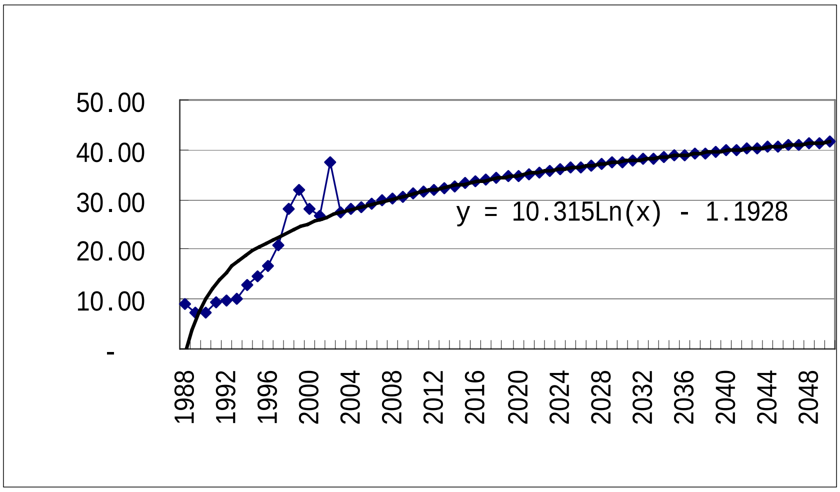
7

1988 15

20 1 2010

3115 2020 3487

4 7



4-7

1999 2002

10

34 2014

12% 29

2014 35%

25

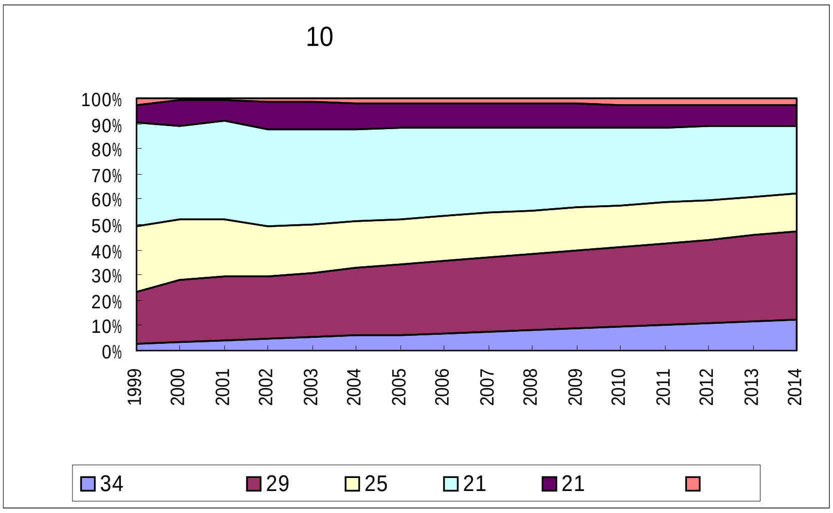
2014 15%

21 2014

27% 8%

2014 3%

10 4-8



4-8 10

1.

2.

3.

4.

CRT

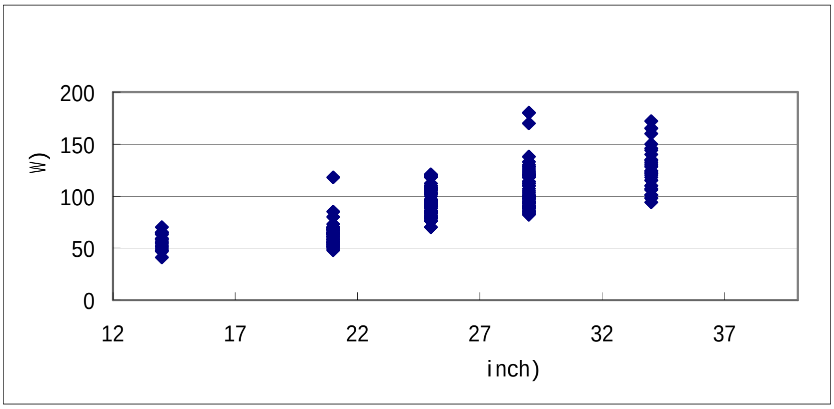
34 29 25 21 21

253

✓

✓

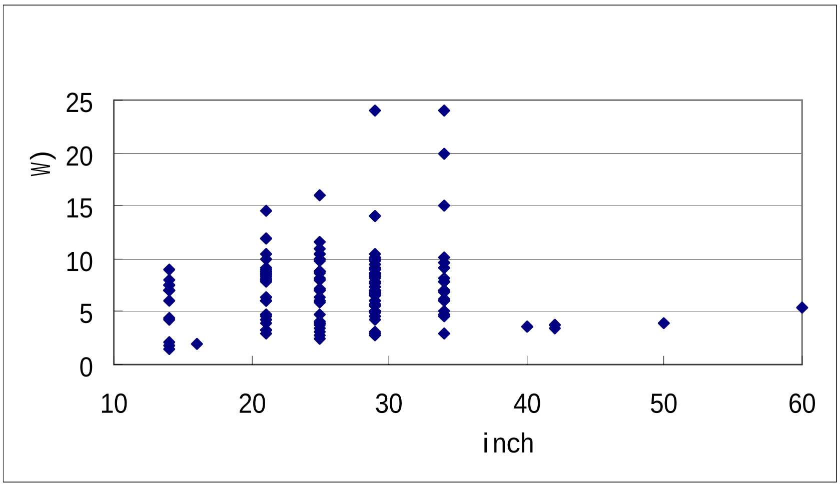
5-1 5 1 5-2 5 2



5-1 CRT

5－1 CRT

inch)	W)					
34	172	94	125.3	2.14	0.91	1.39
29	180	82	106.4	2.41	0.8	1.26
25	121	70	94.0	2.04	1.04	1.40
21	85	48	61.6	1.73	0.94	1.20
21	70	41	56.7	1.59	0.82	1.31



5-2

5－2 PDP,LCD

W)						
			1W	3W	5W	9W
20	1.4	7.3	0	6	26.5	79.5

GEEA 50Hz 100Hz

50Hz 100Hz

5 3

5 4

5－3

	Hz	**Hz**	**W**	**W**
1	60	18750	128	4
2	60	18750	110	4
3	75	23437	118	4
4	60	18750	118	4
5	60	23437	133	4
6	75	28125	118	4
7	75	31500	127	4
8	75	31500	113	12
9	100	33750	146	4

5－4

Hz	**Hz**	**W**	**W**	
100	31500	175	1	(110HZ)
50	31500	171	1	(50HZ)
50	28125	166	1	1080i/50 YPBPR
60	33750	155	1	1080i60 YPBPR
50	37500	170	1	720P YPBPR
60	37900	169	1	VGA 800*600
60	31500	169	1	VGA640*480

5 3 5 4

2-5 50Hz625

2-6 △ 0 2-6

△ 23W

1

20%

9W 1.5

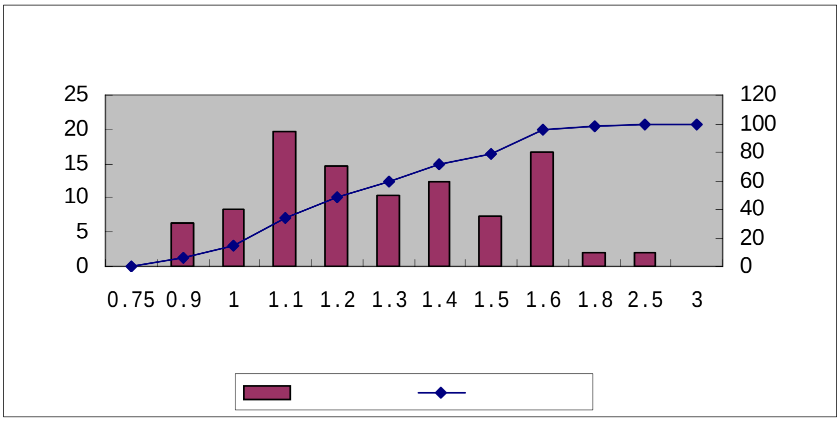
82.4% 78%

5-5 5-6 5-3 5-4

5—5 CRT

0	0		
0.75	0	0	0
0.9	2	2.2	2.2
1	5	5.5	7.7
1.1	16	17.6	25.3
1.2	12	13.2	38.5
1.3	15	16.5	54.9

1.4	14	15.4	70.3
1.5	7	7.7	78.0
1.6	16	17.6	95.6
1.8	2	2.2	97.8
2.5	2	2.2	100.0
3	0	0	100.0

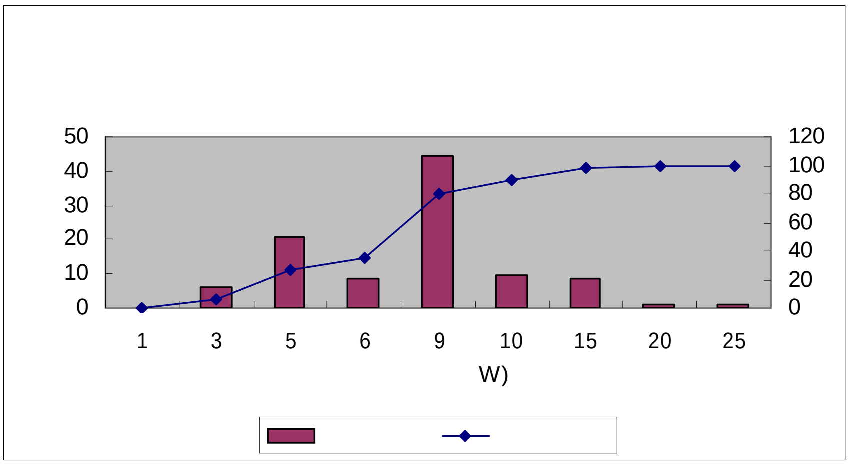


5-3

5－6 PDP,LCD

W			
0	0		
1	0	0	0
3	10	6.0	6.0
5	34	20.5	26.5
6	14	8.4	34.9
9	74	44.6	79.5
10	16	9.6	89.2

W			
15	14	8.4	97.6
20	2	1.2	98.8
25	2	1.2	100.0



5-4

2

20

1.1 17.6% 5 3 5 5

2001

3W 2003

6 TCL 18

2.12W 0.8W

3W

“ ”

3

80

9

90

5 0

“ ”

“ ”

“ ”

3 5 /

3

5W

1.0

1W GEEA

0.75

1

LCC

PC OC

6 1

$$LCC = PC + \sum_{t=1}^{N} \frac{OC_t}{(1+r)^t}$$ ………………… 6-1

LCC—

PC—

OC$_t$— t

r— t=1 2 3 ……N N—

OC

6-1 6 2

$$LCC = PC + PWF * OC$$ ………………… 6-2

PWF 6 3

$$PWF = \sum_{t=1}^{N} \frac{1}{1+r^{t}} = \frac{1}{r}\left[1-\frac{1}{(1+r)^{N}}\right]$$ ………………… 6-3

6—2 6 4

$$LCC = PC + \frac{OC}{r}\left[1-\frac{1}{(1+r)^{N}}\right]$$ ………………… 6-4

“ ”

2

PAY OC

6-5

$$\Delta PC + \sum_{t=1}^{PAY} \Delta OC_t = 0$$

………………… 6-5

ΔPC——

ΔOC_t—— t

t=1 2 3 ……N N——

6-5 6 6

$$PAY = -\frac{\Delta PC}{\Delta OC}$$

………………… 6-6

PAY——

ΔOC——

●

●

●

●

●

●

GB/T10239

15000

1

GEEA

Top runner 4

20 4.5

19.5 2001

24

5.13 2

16.87

2000 2001 184 2002 179

1080

6 1

1 2

7

6－1

	/	/		
	5.13	210.5	1080	7%
1	2	210.5	421	

2	4	365	842	

2

6 2

GEEA 34 29 25 21 14

4 3

50Hz 1

6 3

6－2 W

9	5	3	1

6－3 W

inch	EEI 1	EEI 1.5	EEI=1.0	EEI=1.1	EEI=0.75
34	96.0	144.0	96.0	105.6	72.0
29	81.9	122.9	81.9	90.1	61.4
25	71.6	107.4	71.6	78.8	53.7
21	61.7	92.6	61.7	67.9	46.3
14	45.0	67.5	45.0	49.5	33.8

6 1

6 4 6 5

6－4

	W	h/y	kWh/y	kWh/y
1		2h		
	9	421	3.79	-
	5	421	2.11	1.68
	3	421	1.26	2.53
	1	421	0.42	3.37
2		4h		
	9	842	7.58	-
	5	842	4.21	3.37
	3	842	2.53	5.05
	1	842	0.84	6.74

6－5

	inch	W	h/y	kWh/y	kWh/y
	34	144.0	1080	155.5	-
	29	122.9	1080	132.7	-
	25	107.4	1080	116.0	-
	21	92.6	1080	99.9	-
	14	67.5	1080	72.9	-
	34	96.0	1080	103.7	51.8
	29	81.9	1080	88.4	44.2
	25	71.6	1080	77.3	38.7
	21	61.7	1080	66.6	33.3
	14	45.0	1080	48.6	24.3

	inch	**W**	**h/y**	**kWh/y**	**kWh/y**
	34	105.6	1080	114.0	41.5
	29	90.1	1080	97.3	35.4
	25	78.8	1080	85.1	30.9
	21	67.9	1080	73.3	26.7
	14	49.5	1080	53.5	19.4
	34	72.0	1080	77.8	77.8
	29	61.4	1080	66.3	66.3
	25	53.7	1080	58.0	58.0
	21	46.3	1080	50.0	50.0
	14	33.8	1080	36.4	36.4

3

6 6

6 – 6

inch	
34	6000
29	4000
25	2500
21	1500
14	800

CPU

ON

1 15

8 ,

5W 3W,

10 1W 20 30

2

6-7

6－7

	1.5	9	1.0	5	1.1	3	0.75	1
34	0	0	100	10	100	10	200	20

	1.5	9	1.0	5	1.1	3	0.75	1
29	0	0	100	10	100	10	200	20
25	0	0	50	10	50	10	100	20
21	0	0	50	10	50	10	100	20
21	0	0	50	10	50	10	100	20

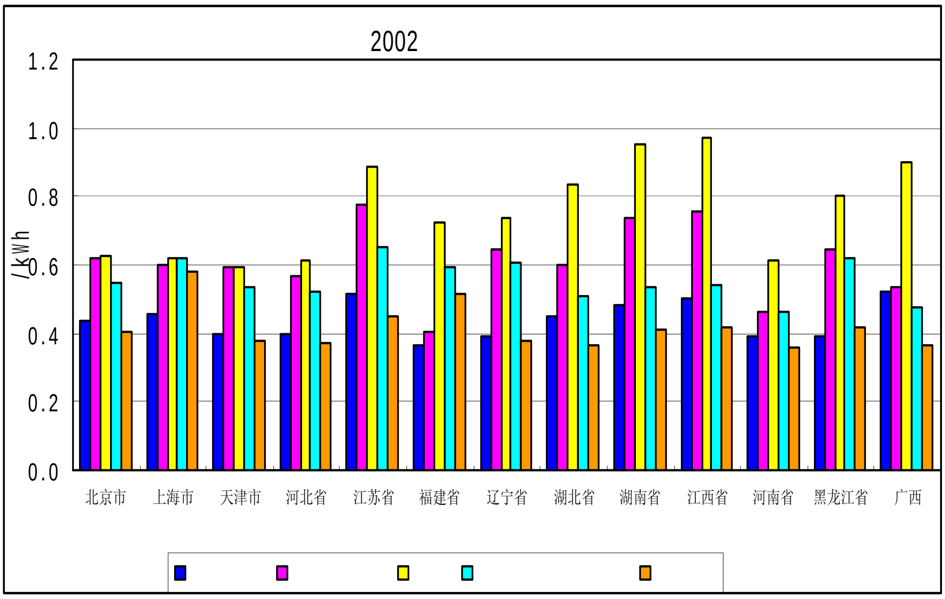
4

1 2002

13

2002 6—1

6—8



6-1　2002

2　2002

2002

6—8

6－8　2002　/kWh

	0.440	0.62	0.626	0.55	0.406
	0.455	0.597	0.618	0.62	0.578
	0.400	0.593	0.593	0.532	0.378
	0.400	0.57	0.61	0.519	0.369
	0.515	0.776	0.884	0.649	0.451
	0.365	0.405	0.725	0.592	0.513

	0.392	0.647	0.736	0.607	0.377
	0.452	0.597	0.832	0.509	0.364
	0.481	0.735	0.955	0.536	0.411
	0.501	0.755	0.975	0.543	0.418
	0.391	0.461	0.615	0.461	0.36
	0.392	0.644	0.805	0.621	0.419
	0.520	0.536	0.9	0.474	0.364
	0.439	**0.610**	**0.760**	**0.555**	**0.416**

3

1999 26 6—2

1990 1999 6—3

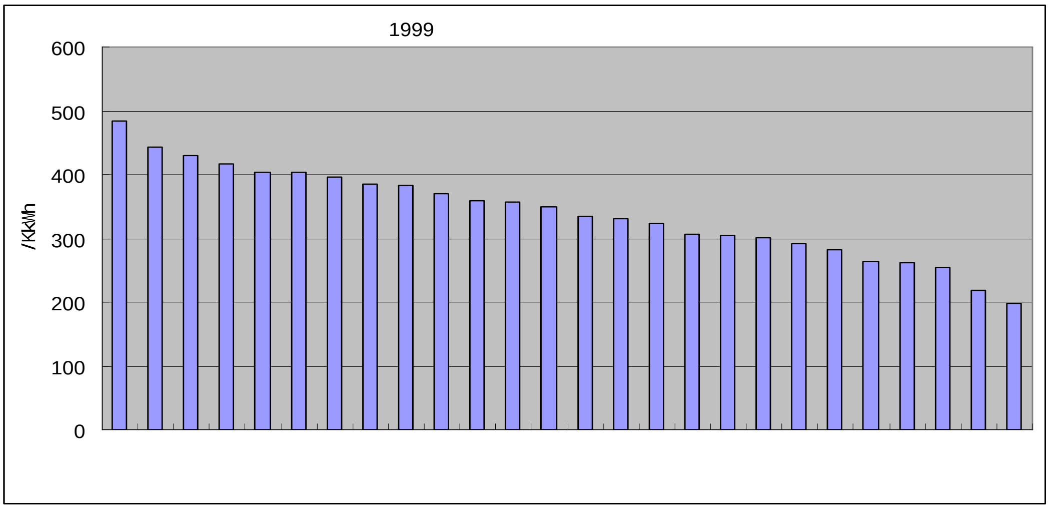
6—2

2.5

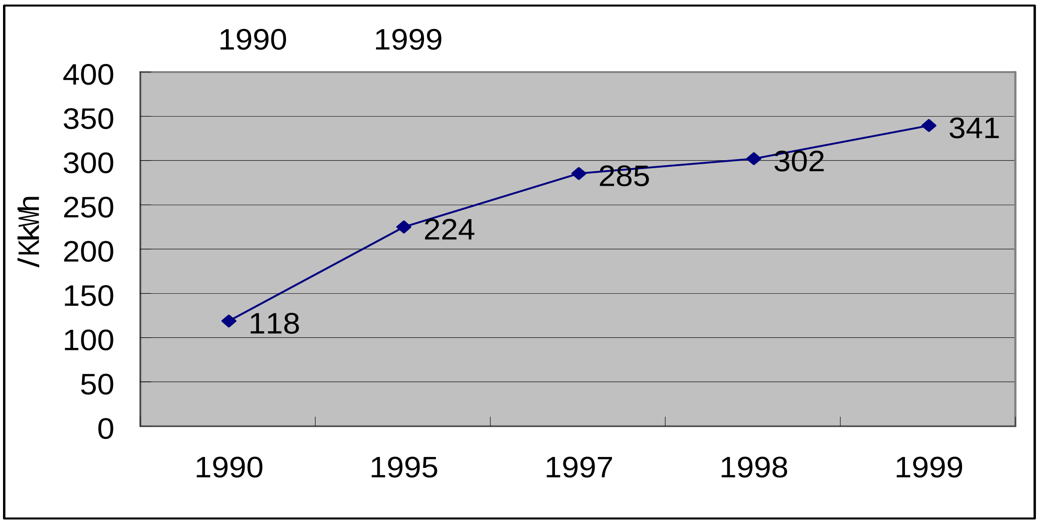
6—3 1990 1999

18.9% 10% 1999 2000

2%



6-2　1999



6-3　1990-1999

6—4　6-6

6 1 6 4 6 5 6 6 6 7 6 8

6—4

6-9 6-10 6-4 6-9

3W

6 – 9

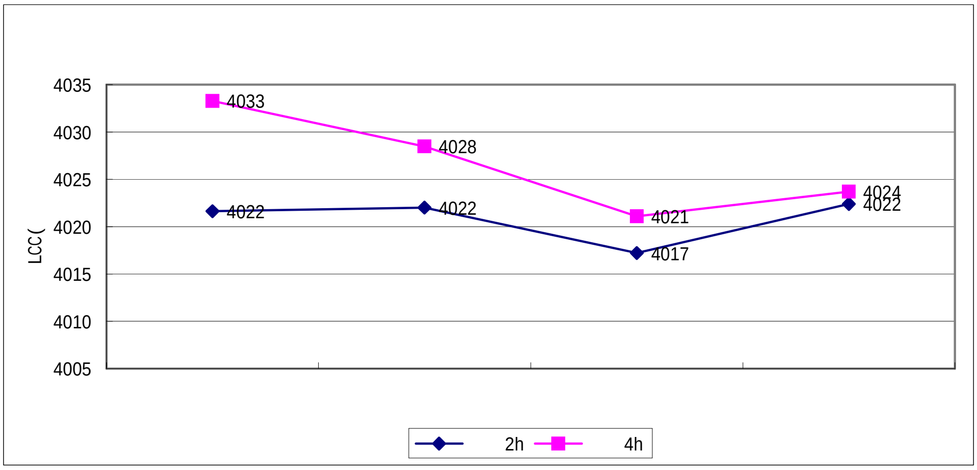
											LCC	LCC		
1	**W**	**kWh/y**	**kWh/y**			**h**	**y**	**/kWh**	**/y**	**/y**			**y**	
	9	3.79		4000.00		15000	35.63	0.439	1.66		4022			
	5	2.11	1.68	4010.00	10.00	15000	35.63	0.439	0.92	0.74	4022	0	13.53	37.99%
	3	1.26	2.53	4010.00	10.00	15000	35.63	0.439	0.55	1.11	4017	4	9.02	25.32%
	1	0.42	3.37	4020.00	20.00	15000	35.63	0.439	0.18	1.48	4022	-1	13.53	37.99%
2														
	9	7.58	-	4000.00		15000	17.81	0.439	3.32		4033			
	5	4.21	3.37	4010.00	10.00	15000	17.81	0.439	1.85	1.48	4028	5	6.77	37.99%
	3	2.53	5.05	4010.00	10.00	15000	17.81	0.439	1.11	2.22	4021	12	4.51	25.32%
	1	0.84	6.74	4020.00	20.00	15000	17.81	0.439	0.37	2.96	4024	10	6.77	37.99%

]

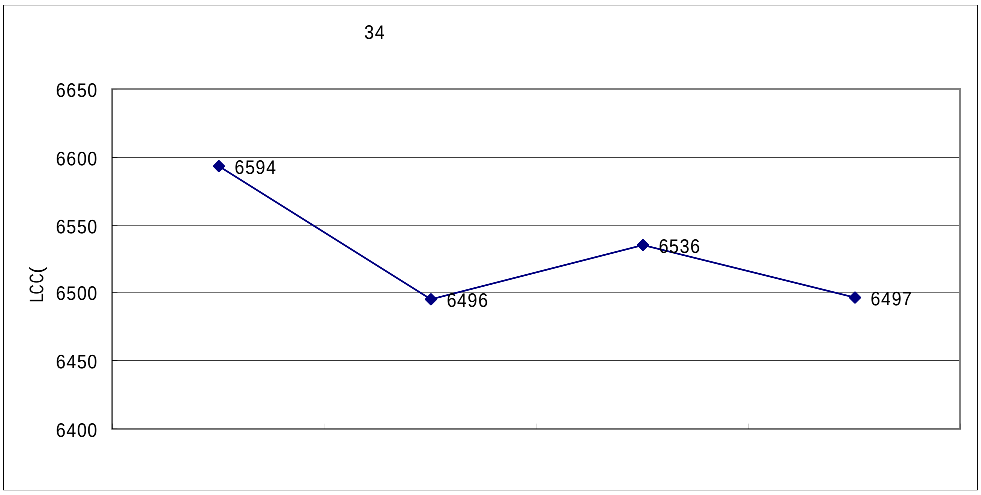
6 – 10

												LCC	LCC		
inch		**W**	**kWh/y**	**kWh/y**			**h**	**y**	**/kWh**	**/y**	**/y**			**y**	
34		144.0	155.5	-	6000.00	-	15000	13.89	0.439	68.23	-	6594	-	0.00	0.00
		96.0	103.7	51.8	6100.00	100.00	15000	13.89	0.439	45.49	22.74	6496	98	4.40	31.65%
		105.6	114.0	41.5	6100.00	100.00	15000	13.89	0.439	50.03	18.19	6536	58	5.50	39.57%
		72.0	77.8	77.8	6200.00	200.00	15000	13.89	0.439	34.11	34.11	6497	97	5.86	42.21%
29		122.9	132.7	-	4000.00	-	15000	13.89	0.439	58.21	-	4507	-	0.00	0.00%
		81.9	88.4	44.2	4100.00	100.00	15000	13.89	0.439	38.81	19.40	4438	69	5.15	37.10%
		90.1	97.3	35.4	4100.00	100.00	15000	13.89	0.439	42.69	15.52	4472	35	6.44	46.38%
		61.4	66.3	66.3	4200.00	200.00	15000	13.89	0.439	29.10	29.10	4453	53	6.87	49.47%
25		107.4	116.0		2500.00	-	15000	13.89	0.439	50.89	-	2943	-	0.00	0.00%
		71.6	77.3	38.7	2550.00	50.00	15000	13.89	0.439	33.92	16.96	2845	98	2.95	21.22%
		78.8	85.1	30.9	2550.00	50.00	15000	13.89	0.439	37.32	13.57	2875	68	3.68	26.53%
		53.7	58.0	58.0	2600.00	100.00	15000	13.89	0.439	25.44	25.44	2821	121	3.93	28.29%
21		92.6	99.9	-	1500.00	-	15000	13.89	0.439	43.85	-	1882	-	0.00	0.00%

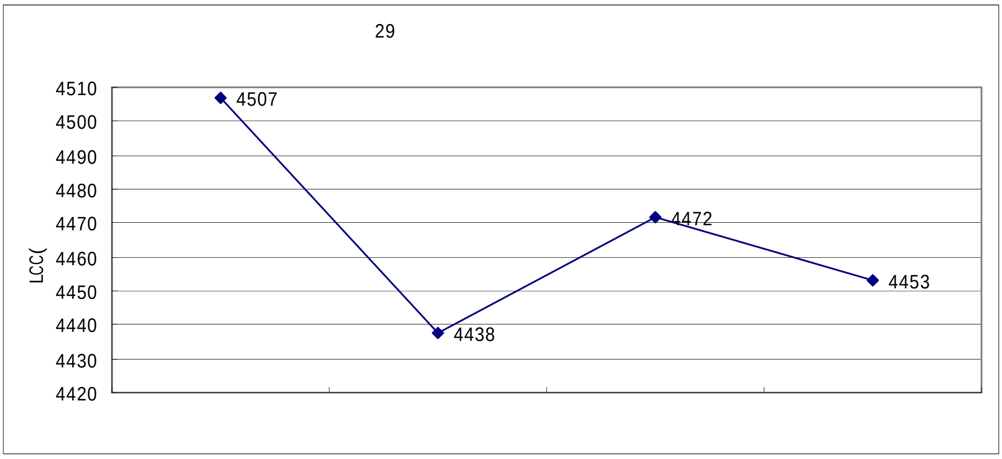
												LCC	LCC		
inch		**W**	**kWh/y**	**kWh/y**			**h**	**y**	**/kWh**	**/y**	**/y**			**y**	
		61.7	66.6	33.3	1550.00	50.00	15000	13.89	0.439	29.23	14.62	1804	77	3.42	24.63%
		67.9	73.3	26.7	1550.00	50.00	15000	13.89	0.439	32.16	11.69	1830	52	4.28	30.78%
		46.3	50.0	50.0	1600.00	100.00	15000	13.89	0.439	21.93	21.93	1791	91	4.56	32.83%
14		67.5	72.9	-	800.00	-	15000	13.89	0.439	31.98	-	1078	-	0.00	0.00%
		45.0	48.6	24.3	850.00	50.00	15000	13.89	0.439	21.32	10.66	1036	43	4.69	33.76%
		49.5	53.5	19.4	850.00	50.00	15000	13.89	0.439	23.45	8.53	1054	24	5.86	42.21%
		33.8	36.4	36.4	900.00	100.00	15000	13.89	0.439	15.99	15.99	1039	39	6.25	45.02%


4035
4030
4025
4020
4015
4010
4005
LCC(
4033
4028
4021
4024
4022
4022
4022
4017
2h
4h

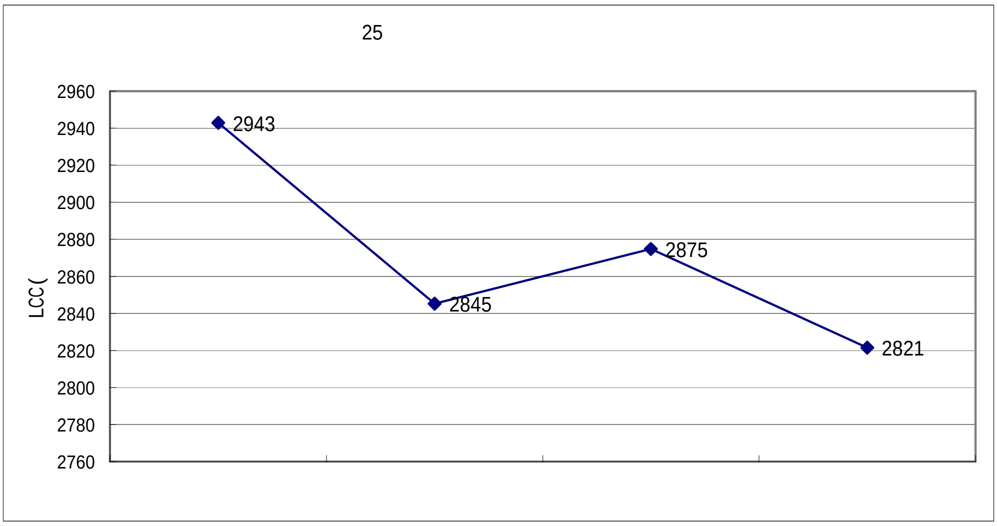
6-4


34
6650
6600
6550
6500
6450
6400
LCC(
6594
6496
6536
6497

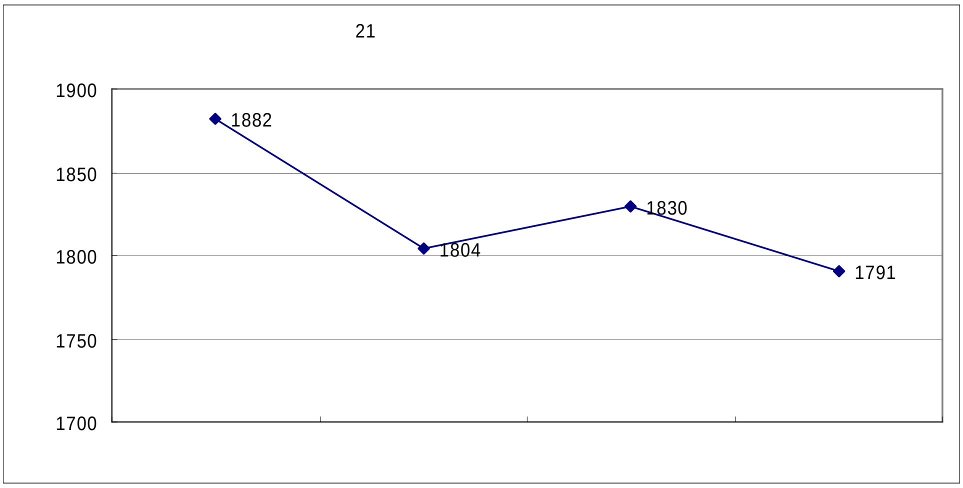
6-5 34


29
LCC(
4510
4500
4490
4480
4470
4460
4450
4440
4430
4420
4507
4438
4472
4453

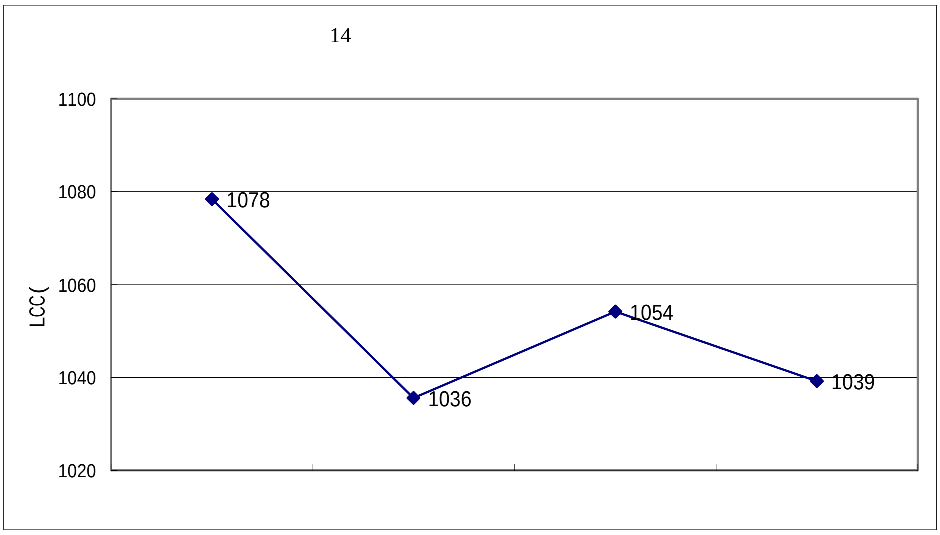
6-6 29


25
LCC(
2960
2940
2920
2900
2880
2860
2840
2820
2800
2780
2760
2943
2845
2875
2821

6-7 25



6-8　21



6-9　14

6-9　　6-10　　　　(6—8)

$$PAY = -\frac{\Delta PC}{\Delta EC} \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad 6\text{-}8$$

12 120 /

8.5 130 / , ΔPC=12

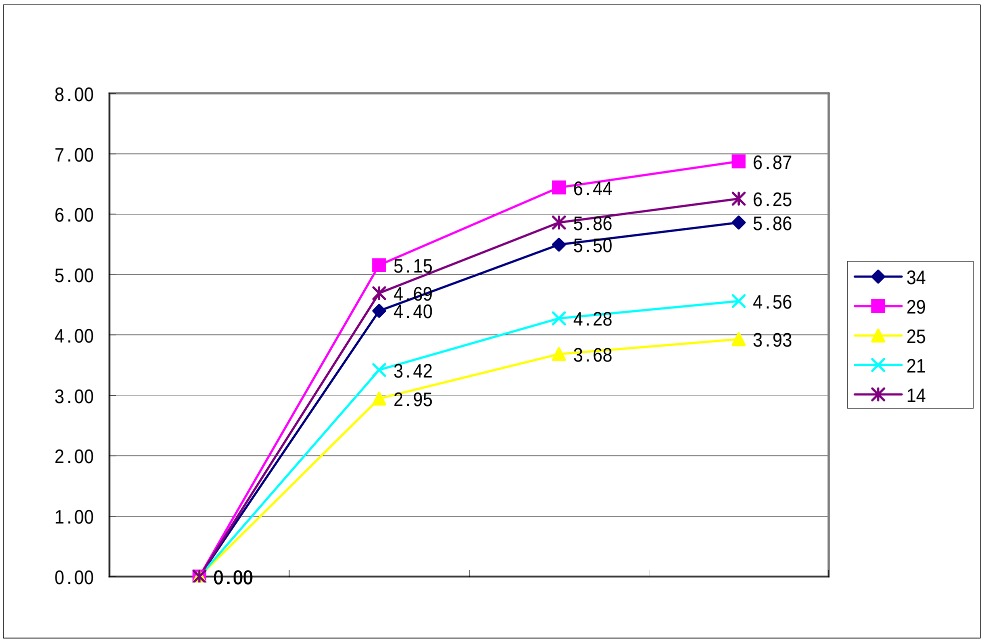
-8.5 =3.5 ΔEC=130 / -120 / =10 /

$$PAY = -\frac{\Delta PC}{\Delta EC} = \frac{3.5}{10} = 0.35y$$

6-10

25 14

29



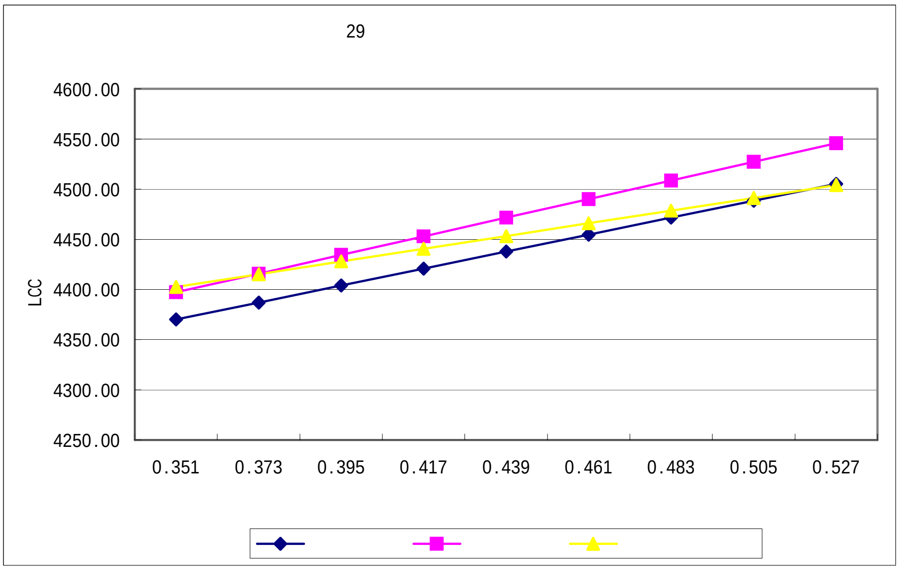
6-10

1

2002 80% 85% 90% 95% 100% 105%

110% 115% 120%

29 6-11

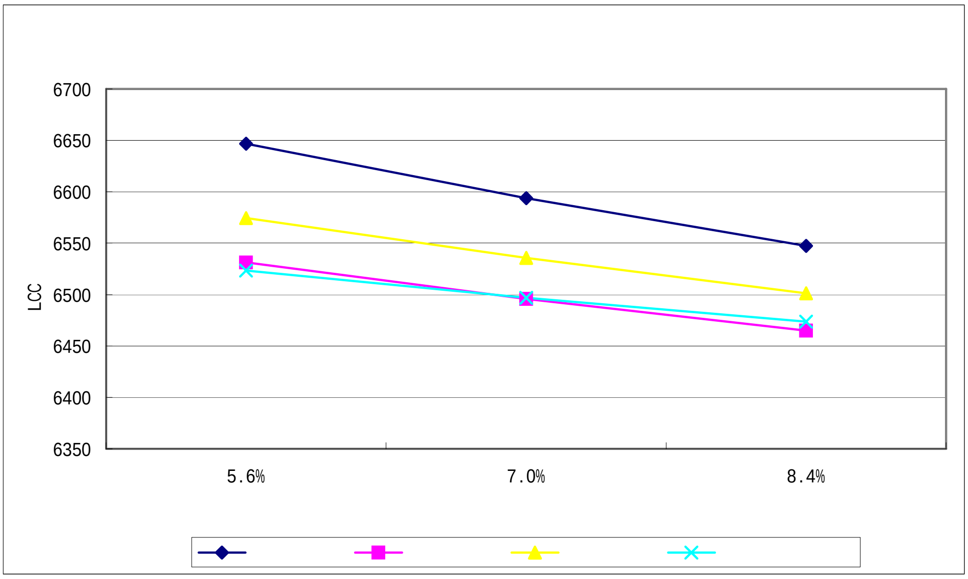


6-11 29

2

80% 120%

34 6-12



6-12 (34)

2005 2005 2014

1. 34 29

25 21 14

2.

3.

4.

5.

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1

2004 5

2005

2005 2014

2

34 29 25 21

14 10 4 4

4-7 2005 2014

7-1 7-2

7 – 1 2005 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	28.62	29.18	29.71	30.21	30.69	31.15	31.59	32.01	32.41	32.80

7 – 2 2005 2014

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
34	6.5%	7.1%	7.7%	8.3%	8.9%	9.6%	10.2%	10.8%	11.4%	12.0%

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
29	27.5%	28.3%	29.2%	30.0%	30.8%	31.7%	32.5%	33.3%	34.2%	35.0%
25	18.3%	18.0%	17.6%	17.2%	16.9%	16.5%	16.1%	15.7%	15.4%	15.0%
21	35.7%	34.7%	33.8%	32.8%	31.8%	30.9%	29.9%	28.9%	28.0%	27.0%
14	10.1%	9.8%	9.6%	9.4%	9.2%	8.9%	8.7%	8.5%	8.2%	8.0%
	1.9%	2.0%	2.1%	2.3%	2.4%	2.5%	2.6%	2.8%	2.9%	3.0%

3

6-1

2h 5.13h 1080

7%

4

GB/T10239

15000h 19000h 10

“ ”

10 100 11

0

5

LED PDP CRT

LED PDP 2003

2005

2008

7-3 7 4

7 – 3

		2003	2005	2008	2014
	≥ 9W	20.5			15.0
	<9W	53.0			55.0
	(<5W)	20.5			22.0
	(<3W)	6.0			7.0
	(<1W)	0			1.0
	≥ 9W	20.5	0	0	0
	<9W	53.0	65	0	0
	(<5W)	20.5	25	70	30
	(<3W)	6.0	9.5	25	40
	(<1W)	0	0.5	5	30

2003 2005 2008 2014

7－4

		2003	2005	2008	2014
	≥1.5	20.8			18.0
	(<1.5)	44.8			37.0
	(<1.0)	14.6			11.0
	(<1.1)	19.8			33.0
	(<0.75)	0.0			1.0
	≥1.5	20.8	0.0	0.0	0.0
	(<1.5)	44.8	60.0	0.0	0.0
	(<1.0)	14.6	17.0	90.0	70.0
	(<1.1)	19.8	22.0	0.0	0.0
	(<0.75)	0.0	1.0	10.0	30.0

2003 2005 2008 2014

6

2005 2014

7 1

2005 2014

7 2 7 3

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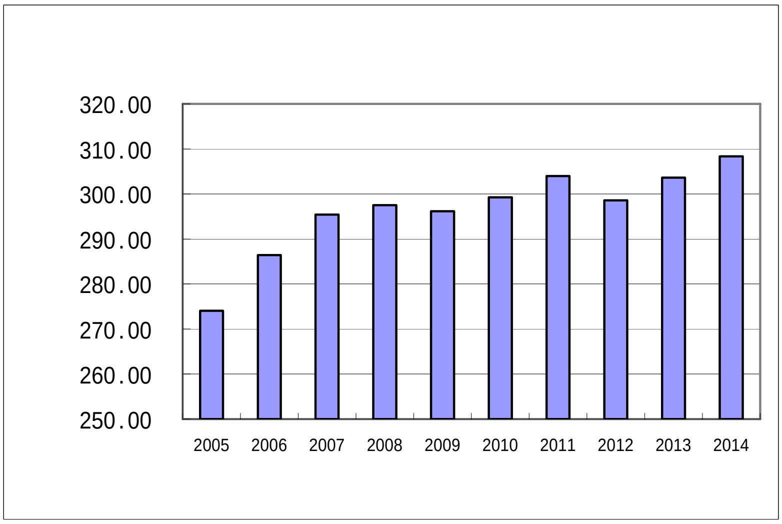
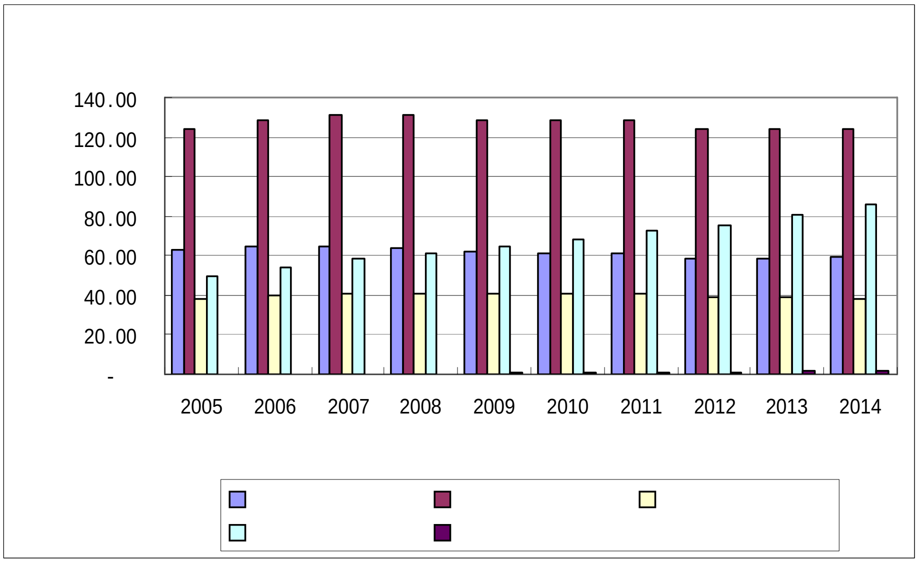
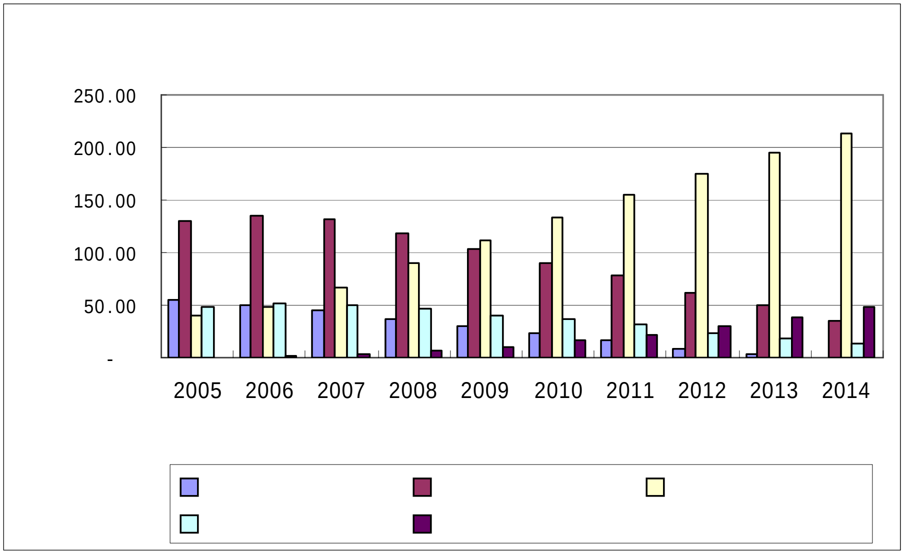


7-1　2005　2014



7-2



7-3

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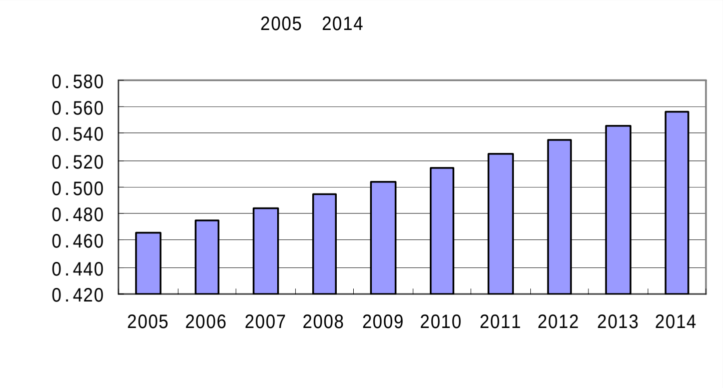
7 4 2005-2014



7-4 2005 2014

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2003

11.34W

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7－5

inch		W	kWh/y
34	1.8	169.6	317.6
29	1.7	137.8	258.0
25	1.6	115.4	216.1
21	1.6	97.0	181.6
14	1.5	68.8	128.8

9

7

10.

CO_2 (7 1)

$$Q = \alpha \times \frac{44}{12} \times E \times 10^{-6}$$ ………………… 7-1

Q ----CO_2 t_ CO2 ;

α--- CO_2 g-C/kWh ;

$\frac{44}{12}$---- CO_2

E----- kWh

CO_2 7 6

7–6 CO_2 **kg-c/kgce**

DOE/EIA	0.702	0.478	0.389
	0.756	0.586	0.449
	0.680	0.540	0.410
	0.748	0.583	0.444
	0.726	0.583	0.409
	0.656	0.591	0.452

DOE/EIA 1999 1999

1998 GEF

1995 ADB 1994

1994

2002 383gce/kWh [9] 7 6 7

7

7－7 CO_2 α g-c/kWh

DOE/EIA	269
	290
	260
	286
	278
	251

α 260g-c/kWh

NO_x SO_2

[10]

NO_x 0.004kg/kWh

SO_2 0.053kg/kWh

PM10 0.025kg/kWh

10 10

2005 2014 10

377.2 200

C 9.81M NOx 15 SO_2 200

94

21.6 11.5 C 0.56M

NOx 0.86 SO_2 11.4

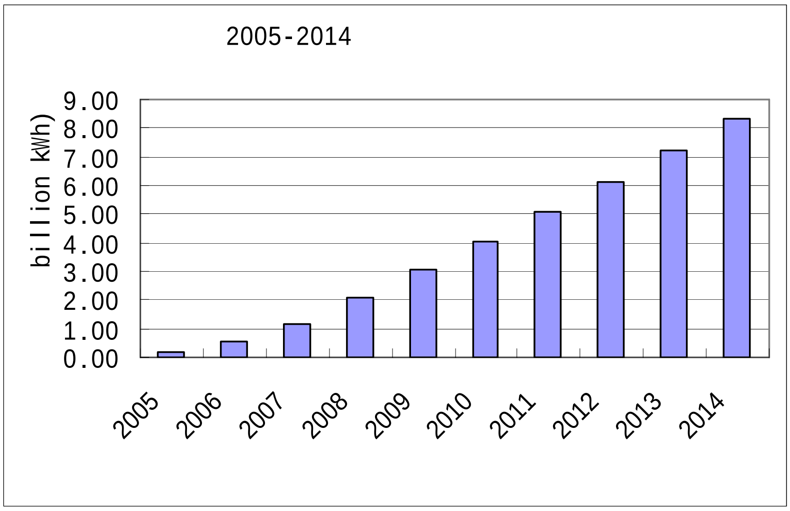
5.4

2005

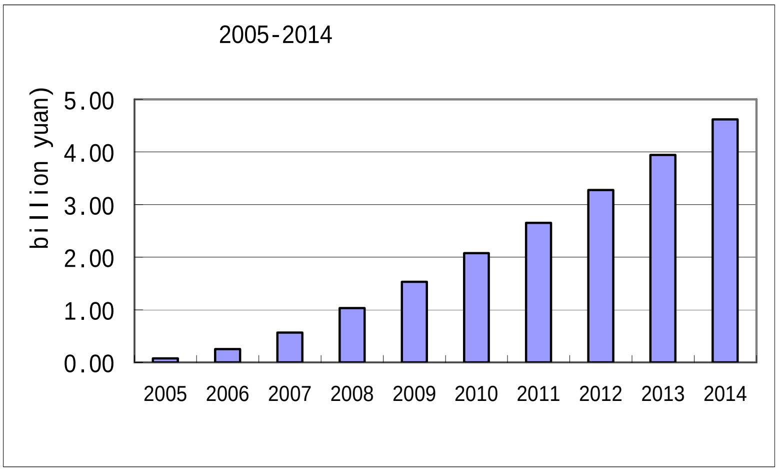
3

7—5 7 6 7 7 7 8 7 9 7 10

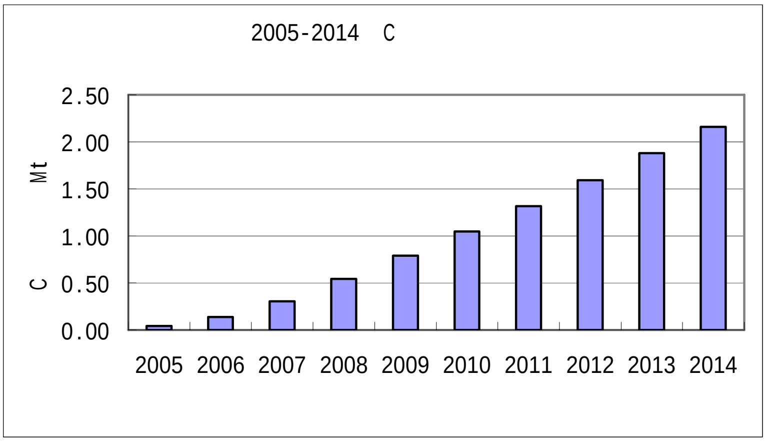
2005 2014 C NOx SO_2



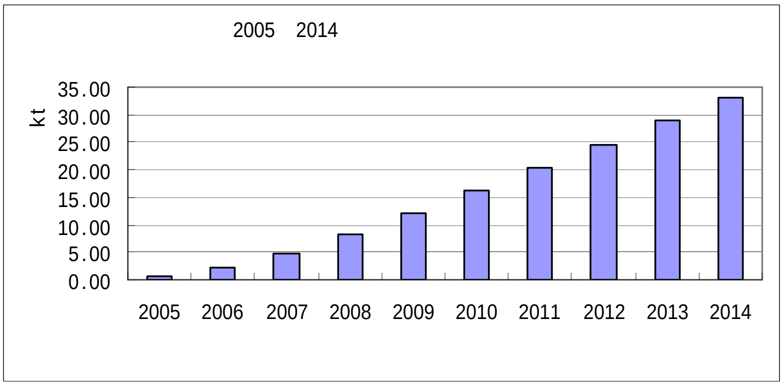
7-5 2005 2014



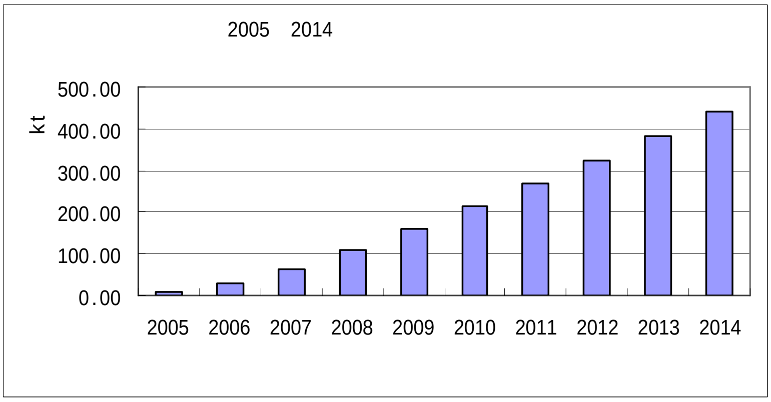
7-6 2005 2014



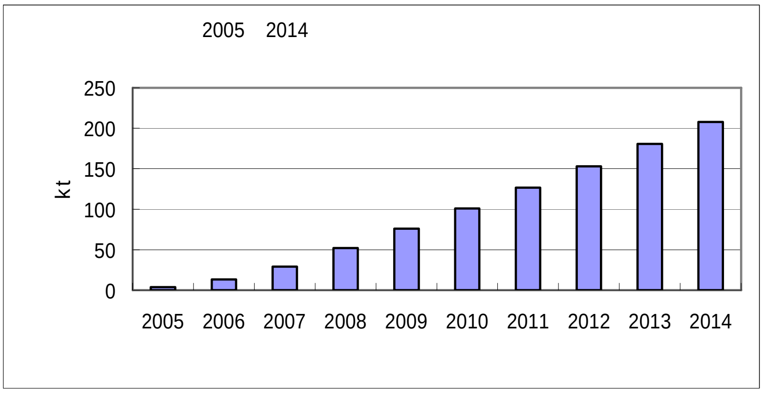
7-7 2005 2014 C



7-8 2005 2014



7-9 2005 2014



7-10 2005 2014

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2.

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