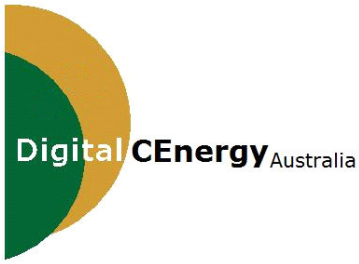

Digital CEnergy
(DCE)

Supplementary Discussion Paper

Television Energy Rating Labels: Options for MEPS and Energy Rating Metric and Introduction Timing

11/12/2007
E3 Report Number 2007/19

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Definitions and Abbreviations used in this Paper

ABL	Automatic Brightness Limiting (Controls brightness levels for CRTs and Plasmas)
APL	Average Picture Level
BLM	Back Light Modulation (Controls brightness levels for LCDs)
CRT	Cathode Ray Tube (Television display technology)
CCFL	Cold Cathode Fluorescent Lamp
DLP	Digital Light Processing (Television display technology)
DVD	Digital Versatile Disc or Digital Video Disc
EEEC	Equipment Energy Efficiency Committee
EPA	Environment Protection Agency
IDTV	Integrated Digital Television
IEC	International Electrotechnical Commission
JEITA	Japan Electronics and Information Technology Industries Association
FED	Field Emission Display (Television display technology)
FPD	Flat Panel Display (LCD, Plasma, OLED, SED, FED etc)
HD	High Definition
LCD	Liquid Crystal Display (Television display technology)
LED	Light Emitting Diode
MEPS	Minimum Energy Performance Standards
MgO	Magnesium Oxide - The breakdown and sustained voltages of Plasma-treated panels are stabilized more rapidly when MgO coating is used.
NBLM	No Back Light Modulation (Controls brightness levels for LCDs)
OASSU	Over the Air System Software Update
OLED	Organic Light Emitting Device (Television display technology)
PDP	Plasma Display Panels (Television display technology)
Phosphor	A phosphor is a substance that exhibits phosphorescence (sustained glowing after exposure to light or energised particles such as electrons).
RIS	Regulatory Impact Statement
SD	Standard Definition
SED	Surface-conduction Electron-emitter Display (Television display technology)

Preamble

The Energy Efficiency committee, through the Australian Greenhouse office, held a stakeholders meeting on 3rd October 2007 to discuss the contents of a paper prepared by Digital CEnergy Australia (DCE) on television MEPS and Labelling for Australia. During that meeting a metric was presented along with a time line of implementation for consideration. This paper has been prepared to further discuss this issue, comments received from industry and potential alternative metrics and timelines.

To prepare for the next round of discussion a review has been done on the programs and other work that is being done around the world, most notably the EPA Energy Star program and the EuP Preparatory Report on TVs. In addition issues surrounding 1080 Plasma have been researched.

Some additional measurements have also been conducted on 1080 (also known as Full HD) Televisions. This data is presented in this paper.

The paper concludes by presenting a number of options for the way forward that are to be discussed at a second stakeholder meeting on 20th December 2007.

International Metric Development and Recent Reports

EuP Preparatory Report on TVs

In August 2007 the EU published its EuP Preparatory Report on TVs. This report is a comprehensive report on the environmental issues associated with televisions and covers more than just the energy issues. It is not appropriate to cover in detail the energy issues discussed in the report here. What will be covered are areas that should clarify the approach taken in Australia and how this approach is not inconsistent with the EU. The EU report will be considered in more detail in the CBA stage of the Australian TV MEPS and Labelling implementation.

Summary of the Energy Issues in the Report

Highlighted in the report are similar findings that were reported in the initial DCE Paper. The findings are associated with the potential for Backlight

technology improvements for LCD televisions. For plasma technology the EU report also identifies the work being conducted on improving

Option	Specification of improvement	Improvement potential	Cost factor / availability
BLU driver / inverter circuitry improvement	Advanced BLU driver / inverter circuitry with electrical efficiency of ș 80 to 85%.	Good (+)	Cost neutral electronic components and board design (cost trade-off possible)
Complete dimming of BLU	Scaling of the complete backlight is state of the art and results in an increase of the energy efficiency of the LCD. The effective reduction in power consumption depends on the whites point (APL) of the shown video image.	Good (+)	Cost neutral electronic components and board design (cost trade-off possible)
Partial dimming of BLU	Advanced BLU dimming reduces power consumption of single lamps selectively (e.g. the black strips on top and bottom of a picture that occur when displaying wide screen movies).	Very Good (+ +)	Cost increase electronic components and board design (cost trade-off possible)
Ambient brightness related dimming of BLU	Advanced BLU dimming (complete and partial) in relation to the ambient brightness conditions. Light-sensor with controller board necessary. Further improvement of energy efficiency possible if consumer utilizes this feature.	Good (+)	Cost increase sensor integration and controller board
EEFL-BLU	New - commercially available - BLU type with lower rated power consumption and simpler circuitry design. In combination with BLU dimming technology very good energy saving potential. Lower mercury content (<4 mg) than CCFL.	Very Good (+ +)	Cost neutral or down limited availability for larger size LCD-BLU (cost trade-off possible)
LED-BLU	Very new – not yet mature – BLU type allegedly very high power saving potential due to low power requirements and capability of image controlled selective dimming. No known hazardous substances (however, material composition diverse, manufacturing and electronic packaging unknown).	Excellent (+ + +)	Cost increase (+ +) currently very limited availability, could improve with mass application within next five years, IP issues unknown
LCD panel design	General improvement of optical properties of functional layers, color filter and pixel design (e.g. RGB + White pixel), electrical driving scheme resulting in higher light utilization. This in turn can reduce the number of necessary lamps and power consumption accordingly.	Unknown	Unknown proprietary technology
Efficient polarizer / fewer lamps	Reflective polarizer (e.g. marketed by 3M) or prismatic film achieves a higher utilization of the lamp's randomly emitted light. This in turn can reduce the number of necessary lamps and power consumption accordingly.	Excellent (+ + +)	Cost increase (+ +) proprietary technology
Efficient switched power supply unit	The improvement of the electrical efficiency of the main PSU up to 85% or 90%	Very good (+ +)	Unknown electronic components and board design, (cost trade-off possible)
Direct power supply for BLU	Direct power conversion from mains input to BLU. Avoid lower voltage intermediate steps. Very good potential for electrical efficiency improvement.	Very Good (+ +)	Unknown BLU supplier relation issues, power board design

Table 1: Potential Energy Efficiency factors for LCD TVs

luminescence to 3lm/W or better as having significant potential to improve this technology's energy efficiency.

The report further identifies the common factor of power supply efficiency as having significant potential improvement for all types of televisions.

Tables 1 & 2 are from the EU study and show the potential factors that could be improved and the scope of that improvement.

Option	**Specification of improvement**	**Improvement potential**	**Cost factor / availability**
PDP design for 3 lm/W luminescence efficiency	Technology specific improvement of the cell structure, material composition, electrical and optical design, and integrated energy recovery circuitry resulting in higher luminescence efficiency. (full HD need attention)	Excellent (+ + +)	Cost neutral or decrease. Decrease in power consumption makes costs for circuitry and heat sinks decrease (proprietary technology)
PDP driving scheme improvement	Active brightness / power control Driving scheme improvement is achieved by improved signal processing algorithm (chip design and software)	Good (+)	Cost neutral (proprietary technology)
Thermal management without fans	Improved luminance and power supply efficiency could make cooling fans obsolete.	Good (+)	Cost decrease
Efficient switched power supply unit	The improvement of the electrical efficiency of the main PSU up to 85% or 90%	Very good (+ +) potential 10% to 20% decrease in power	Unknown electronic components and board design, (cost trade-off possible)
Lead-free PDP design	Substitution of Lead in glass frits etc.	Good (+)	Unknown (proprietary technology)

Table 2: Potential Energy Efficiency factors for PDP TVs

The Report also presented a data set of some 272 TVs in addition to the TVs that were measured for the base case. Unfortunately the additional data was provided on a survey basis and according to the report was sourced from manufacturers' data rather than measurement. This means that figures quoted are likely to be either maximum power consumption or derived from the JEITA test measurement which makes it inconsistent with the data set in DCE's original report. Having said this, the data set did have the similar characteristics to the DCE data, the UK data and the EPA data in that for any

screen size and technology a large spread of power consumption was evident. This data was used to determine a metric which expressed as cm^2 is:

$$P_{TV\ on\ minimum\ Requirement} = .043\ W/cm^2 + 40$$

The report further breaks down the 40W allowance as per table 3.

Components	Reference Power Consumption	Comments
Digital signal processing	20W	DSP has improvement potential through system LSI development
Digital memory	4 W	Cache memory requirements will increase for full HID performance
Analogue tuner	4 W	Integration of multiple digital tuners might increase power demand in total
Interface components	4 W	Integration of modems might increase power demand in total
Audio components	1 W	Audio components are of less importance due to the volume control setting (50mW) in the IEC 62087 test standard
Other (e.g. fans)	2 W	Fans, sensors, or other features require power which should find consideration
Power losses (85% PSU efficiency)	5 W	Power consumption of the components fluctuates with use intensity. The occurring power losses are accordingly. 85% PSU efficiency corresponds with the point of LLCC (see task 7)
Total:	**40 W**	

Table 3: 40W Allowance

As will be discussed in a subsequent section this allowance is not dissimilar to the one originally proposed by DCE or with the level proposed in this report.

Discussion on the 1080 issues raised and recommended Allowance

Task 8 of the report also discusses full HD product and suggests an allowance of 1.4 for full HD. The extra energy consumption for full HD in its 1st generation do appear evident although as will be discussed when reviewing Bob Harrison's and Hans Paul Siderius' paper this is not an undisputed view. The justification for the factor of 1.4 is hard to follow and does not seem to be verified as the report clearly states that Full HD product was not considered in it.[1] DCE has conducted further measurements of 1080 product and this data is presented in a subsequent section and the reviewed proposal reflects the concerns expressed in the EU study. It is unclear at this stage whether the 1.4 factor is justified or accurate and, as will be expressed later, it seems premature to adopt such a figure for Australia.

[1] EuP Preparatory Report on TVs Task 5 Section 5.4.1 Page 41

EPA Energy Star developments

The EPA has also continued to develop its specification for energy star. Through a number of communications it is evident that the EPA has also received manufacturer feedback on 1080 Plasma issues. For this reason the latest proposed levels have been separated on a resolution and screen size basis.

	Draft 2	New Proposal
Vertical Resolution	**Maximum On Mode Power Consumption Draft 2 (A expressed in inches^2)**	**Maximum On Mode Power Consumption (A expressed in inches^2)**
480	$P_{Max} = 0.13*A + 25$	$P_{Max} = 0.12*A + 25$
768	$P_{Max} = 0.20*A + 40$	***All HD and FHD TVs (768 & 1080)*** $P_{Max} = 0.20*A + 32$ ($A \leq 650$ inch^2) $P_{Max} = 0.24*A + 22$ (650 inch^2 < $A \leq 1000$ inch^2) $P_{Max} = 0.15*A + 190$ ($A > 1000$ inch^2)
1080	$P_{Max} = 0.20*A + 40$ ($A \leq 650$ inch^2) $P_{Max} = 0.24*A + 14$ ($A > 650$ inch^2)	

Table 4: Summary of New proposed Qualification Levels

The relationship that these formulas have to the proposed MEPS presented in this paper will be discussed in a subsequent section.

Supplementary Paper by Bob Harrison and Hans Paul Siderius on 1080 Issues

As has been mentioned not all commentators agree with the principle that 1080 product should get special treatment Harrison and Siderius have published a follow up paper to the one they released earlier in the year. In this paper they pose the following questions:

"The questions we want to answer in this paper are:

1. can televisions with full HD or HD ready be captured by the EEI as developed in our paper of February 2007[3]?
2. do televisions with full HD or HD ready differ in on-mode power consumption from televisions with Standard Definition (SD), when measured according to the (revised) IEC 62087?
3. do televisions with HD ready differ in on-mode power consumption from televisions with full HD,when measured according to the (revised) IEC 62087?"[2]

[2] Hans-Paul Siderius (SenterNovem), Robert Harrison (MTP) –31 October 2007 "Televisions: the impact of HD ready and full HD on on-mode power consumption"

Without going into detail they analyzed the following televisions included in Table 5 below:

		Resolution			
		SD	***HD ready***	***full HD***	**Total**
LCD	*nr*	2	109	9	120
	average area [dm2]	20	27	43	28
	average power [W]	108	135	200	140
Plasma	*nr*	8	24	5	37
	average area [dm2]	49	51	57	51
	average power [W]	248	316	393	311
Total	*nr*	10	133	14	157
	average area [dm2]	43	31	48	34
	average power [W]	220	168	269	180

Table 5: Data set used by Harrison and Siderius[3]

And concluded the following:

"*Regarding the questions put in the introduction we conclude as follows:*

1. *Yes, televisions with full HD or HD ready can be captured by the EEI as developed in our paper of February 2007.*
2. *In general televisions with full HD or HD ready do not differ in on-mode power consumption from televisions with Standard Definition (SD), when measured according to the (revised) IEC 62087, except for Plasma screens with large screen areas (around 70 dm^2). This suggests that not the resolution as such has an impact on on-mode power consumption, but the technical implementation for a specific type of screen has.*
3. *There is no statistically significant difference in on-mode power consumption measured according to the (revised) IEC 62087 between televisions with HD ready and with full HD."*[3]

It is not proposed to argue the findings of this paper here and this author draws no conclusion at this time as to these findings. The findings are evidence, however, that it may be premature to make any conclusion regarding how 1080 Plasma should be handled.

Update on IEC TV Power Measuring Standard IEC62087 and Australian version AS62087

This section briefly discusses the progress of the amendment to IEC 62087 for TV power measurement and some of the issues that have been raised regarding this work.

[3] Hans-Paul Siderius (SenterNovem), Robert Harrison (MTP) –31 October 2007, Page 5

IEC TC 100 meeting in Colmar

Since the stakeholders meeting on 3rd October 2007, TA1 the IEC TC 100 working group has met in Colmar France and also by teleconference a number of times. This has culminated with a Committee Draft for Voting (CDV) being sent to the TC100 secretariat in Early November. The results of this process are scheduled to be complete in May 2008 and it would be hoped that the result will be positive and the standard would then move to the formal process of printing by August 2008.

The issues that were addressed in the final deliberations were clarifications on the test conditions. Issues associated with the IP surrounding the test clip were also discussed.

Australian Standards Development

To ensure an efficient take up of the IEC work it has been proposed to clone the IEC draft as an interim standard. This will then be formally adopted through the normal standards processes when it is clear that the standard has been approved by the IEC process. This has the advantage of providing a basis for additional measurements on television product to resolve any of the remaining issues associated with the metric.

Issues on the TV testing conditions of IEC62087

It is useful to note that the EU TV study did consider the issues of the IEC 62087 Test conditions. A number of views were expressed some calling for a tighter control in the form of a luminance setting. This issue has been discussed at length in a number of forums. The problem with a luminance based approach is that it is technology dependent with a different luminance required for plasma as opposed to LCD technologies. Also a luminance based measurement does not provide a real life use measurement. It could also be said that the IEC 62087 approach is not without criticism but equally it seems that it has the support of the EPA and the EU and a number of manufacturers . For this reason the recommendation is to use this as the basis of the Australian MEPS and Labelling Scheme still stands.

Stakeholder Feedback

Feedback from 3rd October meeting

A number of views were expressed during the stakeholder meeting on 3rd October. From the point of view of moving the process forward the most important feedback was that the metric and timing of implementation were inextricably linked. Another view was the concern that Australia was moving ahead of the rest of the world in terms of the requirements. The nature and size of the label was also of concern as was where it would be placed on the TV.

It is proposed that these issues be further discussed at the meeting on 20th December and to facilitate this process the issues associated with the Metric and timing are presented later in this paper. The new proposal will form the basis of discussion on the metric and timing at the 20th December Meeting.

On the issue of labelling it is noted that recently a HD Logo label has been agreed to in the market which is attached to the screen. It would seem that a similar approach could be taken with the energy rating label. The size and position of the label is yet to be determined and will be discussed further at the 20th December meeting.

Feedback regarding 1080 Plasma

Subsequent to the meeting on 3rd October issues surrounding 1080 Television product have been raised. The issues are the same as the EPA and EU study have also sought to address. The evidence surrounding this issue is still not clear enough to determine how 1080 televisions should be covered for this program. Consideration of this issue has been included in the new proposed metric and timing. In addition the next section will provide some additional analysis that, along with the review that has already been covered, has formed the basis for the current approach.

Analysis of Data sets including new 1080 Australian Data and the EPA and EU Metrics

New Australian 1080 data and 1080 television measurements

In order to better understand the issue of 1080 televisions extra measurements were taken of several products. In addition data was also received from suppliers. Table 6 presents this new data.

Model	Description	HD	On-Mode Using IEC Test Clip
42 Inch	LCD	Full 1080p	213.2
42 Inch	Plasma	Full 1080p	427.7
42 Inch	LCD	Full 1080p	221.9
50 Inch	Plasma	Full 1080p	546.5
40 Inch	LCD	Full 1080p	225.9
42 Inch	LCD	Full 1080p	218.4
40 Inch	LCD	Full 1080p	246.4
42 Inch	LCD	Full 1080p	222.9

Table 6: Additional 1080 Power Measurements

Placing this new data into the scatter charts of the original data measured is shown in Figure 1

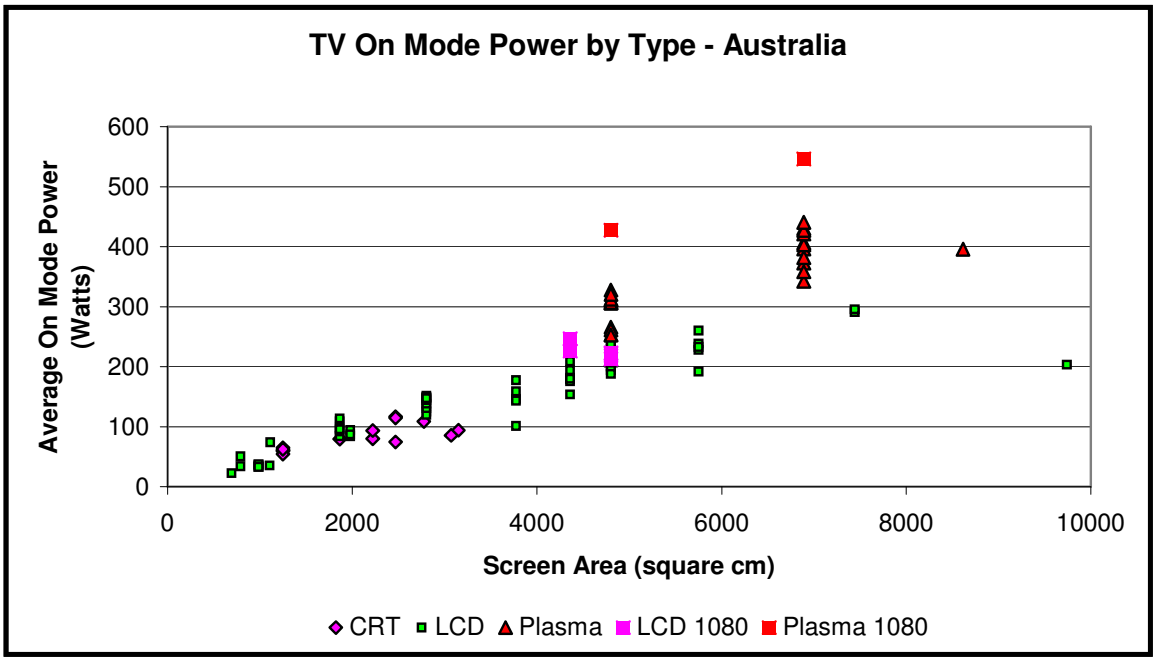

Figure 1: TV On-Mode Power by Type - Australia

Two observations become immediately apparent. The 1080 LCD televisions are shown to be within a similar spread of the non 1080 LCD data and the 1080 plasma are significantly higher than the original plasma data.

EPA and EU Study metrics and the Australian Data Set

Figure 2 show the Australian data set superimposed on the metrics proposed by the EPA, EU TV Study and a new MEPS proposal for Australia.

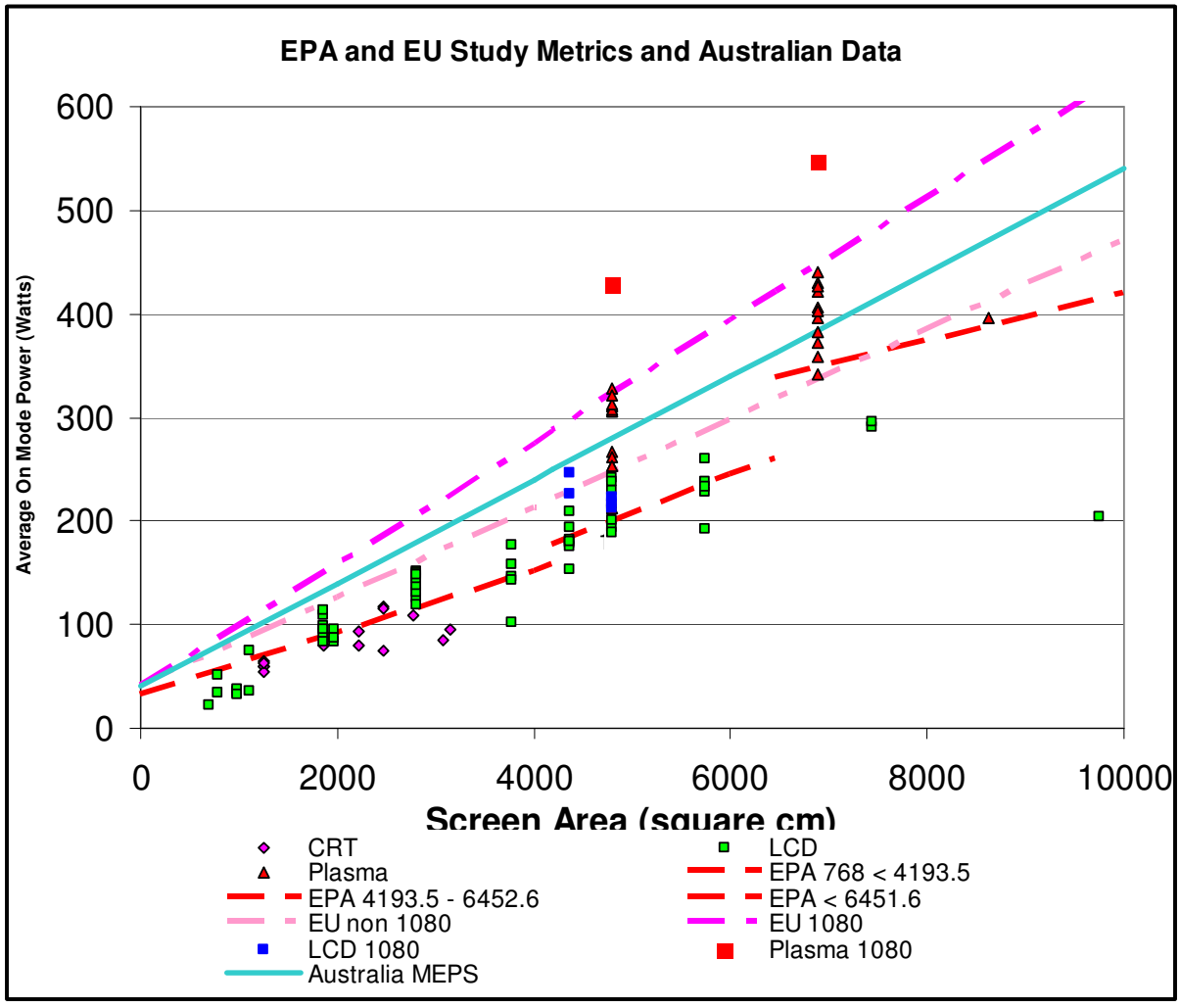

Figure 2: EPA, EU Study and Proposed MEPS for Australian and the Australian Data Set

Shown in this way the more stringent requirements of the energy star program and the non 1080 EU metric become evident. In addition with the limited data that is currently available the 1080 plasma TVs included in the data set still perform significantly worse than the EU study 1080 proposal. The Australian MEPS line is a compromise and would only be applicable to a 1st Tier arrangement. This line is significantly relaxed from the one presented on the 3rd October in light of the concern of stakeholders.

Metric Proposal and timing and associated Recommendations

Given the analysis and discussion since the last stakeholder meeting the MEPS line and energy rating levels for the Australian MEPS and Labelling has been revised and is shown in Figure 3.

The proposed MEPS line produces the following changes to the product available in Australia.

TV Type	< 1 Star	> 1 Star	% Pass
CRT	0	14	100.00%
LCD	0	58	100.00%
Plasma	14	11	44.00%
1080 LCD	0	7	100.00%
1080 Plasma	2	0	0.00%
Total	16	90	84.91%

Table 7: Changes to Australian Product when MEPS is applied

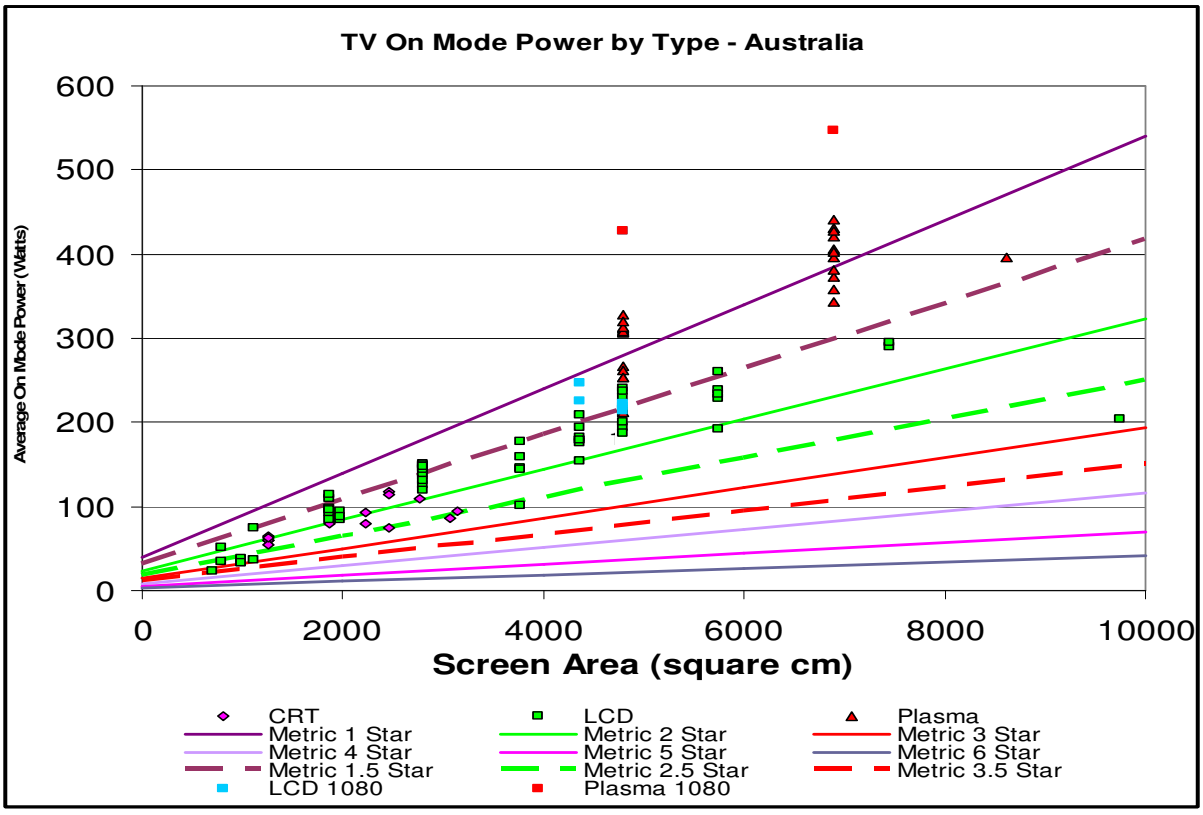

Figure 3: Proposed MEPS and Energy Rating On Mode Power Metric

Consultation outcomes

Based on the poor energy efficiency of most of the models on the Australian marketplace, government agencies do not believe market forces can deliver the required improvement in television greenhouse performance. Initial

industry feedback, following the first discussion paper, was that they would struggle to meet mandatory requirements by October 2008 but that they would agree to regulatory requirements commencing as soon as practicable. This revised government proposal reflects the advice of many key industry players who encouraged delivery of voluntary information mechanisms like labelling quickly while linking mandatory performance requirements and mandatory labelling after a longer notice period.

1080 product status and effect on the metric and timing issues

From the preceding discussion it seems clear that there is international uncertainty in setting a MEPS level for 1st generation 1080 Plasma Televisions. It seems equally clear that 1080 LCD televisions are not being disadvantaged by being included in a MEPS scheme as it has been shown that their energy requirements are similar to the 768 HD televisions. It also seems apparent that the uncertainty associated with 1080 Plasma inclusion will significantly reduce over the coming 12 -18 Months as 2nd generation product is introduced.

Developing a metric that includes 1080 Plasma at this stage seems premature and dangerous. The first implication is that such a metric is likely to be significantly relaxed and thereby not achieving the elimination from the market the poorer performing 768 and below Plasmas as well as allowing inefficient LCD models to be sold. It is equally undesirable to have a different metric for 1080 Plasma as this leads to confusion in the market. It may be that this is unavoidable but delaying the inclusion of 1080 Plasma in the MEPS will give more time to properly determine this.

Recommendation 1

Mandatory measures be delayed until not earlier than April 2009 and that mandatory minimum energy performance requirements commence at a date to be settled by governments which may be different from mandatory labelling.

Facilitating introduction of a Labelled product

The labelling of product should commence as soon as possible as it will provide potential customers with accurate comparative data about television efficiency and greenhouse emissions. Governments are proposing to facilitate

voluntary labelling by suppliers as soon as the Measuring and Labelling standards have been published in their final form. With industry support, this can be achieved in the first quarter of 2008 and labels could appear in the market by mid year. All existing televisions will be accommodated within the comparative energy rating scheme in its voluntary form. In simple terms any product that does not meet the proposed initial MEPS requirement would not be permitted to be labelled at all while those that do meet the proposed levels would be (at their discretion) able to label product in the form specified in the Standard. Suppliers would elect to label (or not) with governments supporting labeled products with a consumer information and education campaign commencing immediately following the publication of the standards.

Recommendation 2

Voluntary labelling introduced early in 2008.

Mandatory Label

A mandatory labelling scheme should start in April 2009 (subject to the completion of a regulatory impact statement and the relevant Ministerial Council approval) to ensure all televisions displayed on showroom floors become labeled by that time. It would become an offence under state, territory or New Zealand law to offer to sell a television that was not labeled or not labeled accurately according to the Standard. This commencement date may or may not coincide with the initial mandatory MEPS.

Recommendation 3

Mandatory labelling should start in April 2009.

MEPS issues

1080 product status

There is uncertainty amongst suppliers in agreeing to government proposals establishing a MEPS level for 1st generation 1080 Plasma Televisions. This uncertainty, however, will significantly reduce over the coming months as 2nd generation product is introduced and their performance better understood. The available data shows that 1080 LCD televisions would not be disadvantaged by being included in a MEPS scheme as their energy requirements are similar to the 768 HD televisions but the uncertainty remains

about whether the features of the 2nd generation product might change this relationship.

Some within industry urge that developing a MEPS metric that includes 1080 Plasma is premature and might not reflect a fair comparison when the additional features and other developments for plasma are taken into account. One option might be to significantly relax MEPS to anticipate the next generation but that would allow poorer performing 768 and below products (Plasma and LCD alike) to be sold. Most commentators agree it would be equally undesirable to have a different metric for 1080 Plasma as this leads to confusion in the market. Delaying the inclusion of 1080 Plasma in the MEPS will give more time to properly consider the issue and determine a fair way forward.

Government agencies however are not proposing to delay labelling of these types of product (1080 Plasma) meaning that such products can be included in the voluntary labelling scheme by suppliers and they will be required to be labeled under the mandatory scheme from April 2009.

Recommendation 4

1080 Plasma TVs may not be included in the 1st Tier MEPS should that level commence in April 2009. Government experts and industry within a working group will continue to study 1080 Plasma energy requirements with a view to announcing mandatory requirements in 2008 commencing not earlier than April 2009 and not later than October 2009.

MEPS 1

Past experience in other products suggests that most greenhouse abatement will be achieved using mandatory energy performance standards. MEPS needs to achieve the elimination of poor performing product while at the same time being achievable albeit with some challenges for manufacturers. The balance needs to be struck between setting a economically viable and technically possible MEPS while assisting industry into a regulated marketplace.

Government agencies and their advisors acknowledge that they do not have a complete understanding of this market and especially of what multinational suppliers are developing within their R&D facilities. This product

type is under constant review and the technology is refreshed within very short product development cycles. What is very apparent is the need to clearly signal the importance of energy efficiency in the future and to assist suppliers to understand their responsibilities in a regulated market.

Suppliers are invited to inform governments about what is feasible in a regulated MEPS environment. As a means of facilitating supplier input, governments propose to call for submissions on a matrix of possibilities with a format that all can participate.

Regulators could regulate an initial MEPS commencing from 1 April 2009 or could delay regulation by six or twelve months from that date. The delay in time might permit industry to agree to a more stringent MEPS though the proposals in the MEPS table are indicative and are to prompt debate.

Timing	***MEPS (set by star rating)***	***% of Product Complying*** ***(Based on current data set)***
April 2009	1 star (with mandatory labelling)	84.91%
October 2009	2 star	35.8%
April 2010	3 star	2.8%

Table 8: Complying Product vs MEPS Star rating and implementation Date

Star Rating	Calculation Formula
1 Star	$365(10*P_{ON}+14*P_{SB}) < 3650*(40.0 + .05A^2)$
1.5 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(31.0 + .039A^2)$
2 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(24.0 + .03A^2)$
2.5 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(18.6 + .023A^2)$
3 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(14.4 + .018A^2)$
3.5 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(11.2 + .014A^2)$
4 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(8.6 + .011A^2)$
4.5 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(6.7 + .008A^2)$
5 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(5.2 + .006A^2)$
5.5 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(4.0 + .005A^2)$
6 Stars	$365(10*P_{ON}+14*P_{SB}) < 3650*(3.1 + .004A^2)$

Table 9: Algorithm for each Star Rating

Recommendation 5

1st tier arrangements to be introduced not earlier than a date and a level to be settled with industry by April 2008.

2nd Tier and beyond requirements

There is a need to give industry certainty about future MEPS levels. Government agencies propose that this might be achieved by setting the second round of MEPS at the best available product registered 3 months after MEPS 1 and commencing that as the MEPS some 3 years after MEPS 1 (sometime within the range April 2012 to April 2013)

Recommendation 3

2nd tier arrangements to be announced 6 months after MEPS 1 is introduced and based on product registered immediately after the first round commencing 3 years after MEPS 1.