DAYLIGHT SAVING IN SOUTH EAST QUEENSLAND

In summer the sun rises in a line parallel to the NSW coast.

The southeastern corner of Queensland has sunrise even earlier in relation to the rest of the state than would be expected from its eastern location (Figure 1).

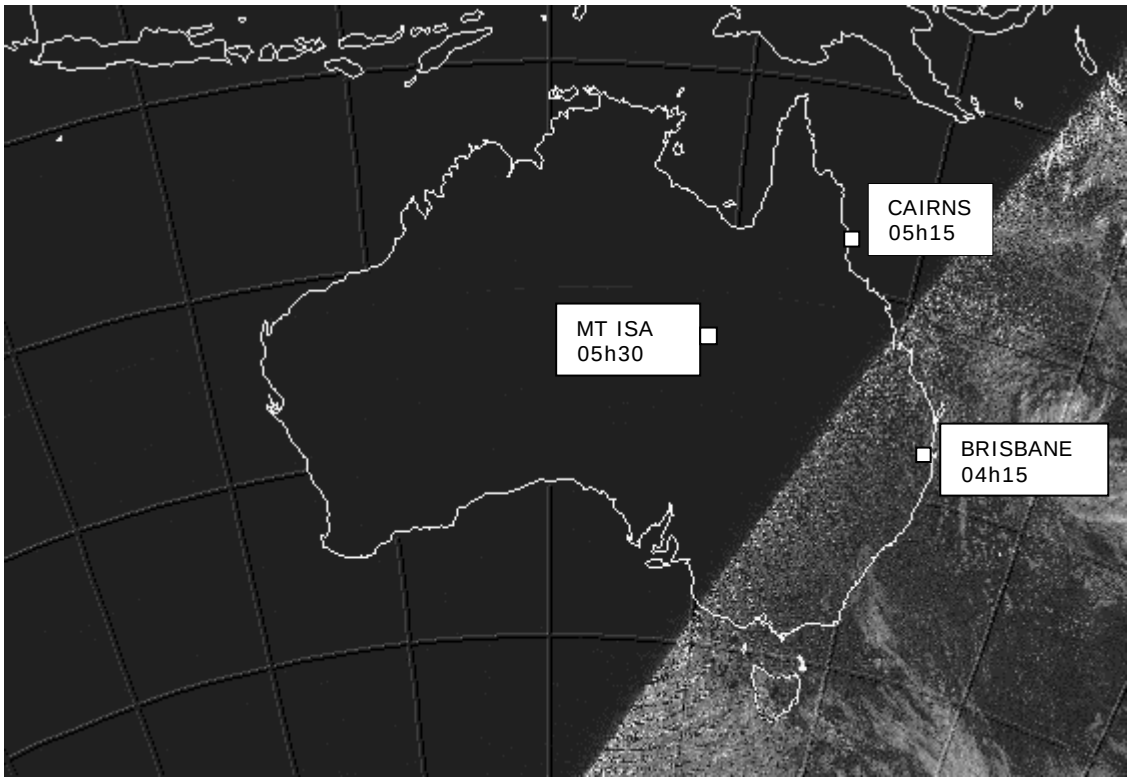


***Figure 1**: Satellite image 8 Dec 2006 at 05h15. **Brisbane** has had light for **60 minutes** but morning twilight is just starting in **Cairns** and is still 15 minutes away in **Mount Isa.** Morning twilight is **75 minutes** earlier in Brisbane than Mount Isa.*

This document shows:-

- SEQ has the **earliest morning twilight** of any region in Australia except Tasmania for two months in mid-summer (page ***1***).
- **Two time zones work well** in 15 states and provinces in the USA and Canada (page ***3***).
- There are **significant energy and road safety benefits** for SEQ with daylight saving (page ***6*** and ***7***).
- Daylight saving in SEQ will have **minimal, if any, effect** on evening temperatures (page ***4***), afternoon heat for children returning from school (page ***5***) and UV exposure (page ***8***).

SEQ – THE REGION MOST SUITED TO DAYLIGHT SAVING IN AUSTRALIA

A region's suitability for daylight saving is not determined by the length of twilight or length of the day **but by the availability of underutilized light in the morning that that can be shifted to the evening.**

Summer morning twilight in SEQ begins between 4:15am and 5:15am. Evening twilight ends between 6:15pm and 7:15pm**.**

Morning and evening twilight occurs earlier in SEQ than in Sydney, Melbourne, Adelaide and Perth on standard time.

SEQ therefore has more light available in the morning and less light available in the evening than any of these regions.

Table 2*: Summer morning twilight *(all standard time)

Region	October	November	December	January	February	March
Brisbane	5:04a	4:33a	4:15a	4:30a	4:55a	5:15a
Melbourne	5:30a	4:46a	4:22a	4:31a	5:05a	5:38a
Adelaide	5:28a	4:47a	4:26a	4:36a	5:07a	5:37a
Perth	5:31a	4:55a	4:36a	4:46a	5:15a	5:40a

Table 3*: Summer evening twilight *(all standard time)

Region	October	November	December	January	February	March
Brisbane	6:11p	6:31p	6:55p	7:13p	7:07p	6:44p
Melbourne	6:50p	7:22p	7:56p	8:16p	8:03p	7:28p
Adelaide	6:44p	7:12p	7:43p	8:02p	7:51p	7:20p
Perth	6:42p	7:07p	7:35p	7:54p	7:45p	7:17p

***THIS IS NOT THE CASE OUTSIDE OF SEQ*.**

Summer morning twilight in Cairns begins between 5:15am and 6:00am and in Mount Isa between 5:30am and 6:15am. Outside of SEQ there is not enough surplus light in the morning which can be saved and shifted to the evening.

SEQ is however ideally positioned to utilize daylight saving. It has more surplus light in the morning than any other region in Australia that can be better utilized in the evening.

IS VICTORIA BETTER SUITED TO DAYLIGHT SAVING THAN SOUTHEAST QUEENSLAND?

"If I lived in Victoria, daylight saving would be a very, very straight-forward proposition." *Anna Bligh, Courier Mail, 17 September 2007*

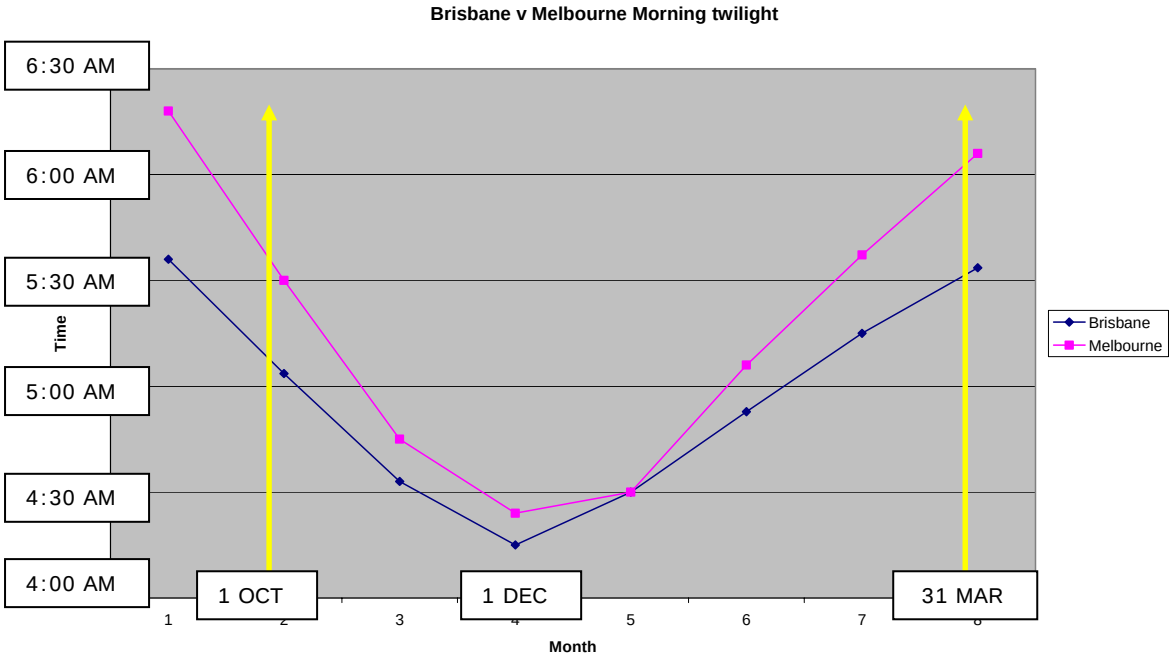


Figure 2: Morning twilight times for Brisbane and Melbourne (all times standard time). During daylight saving morning twilight times will be an hour later for Melbourne.

Temperatures for SEQ and Victoria:-

Region	Days > 30°C	Days > 35°C	Days > 40°C
Brisbane	48	3	0
Toowoomba	28	3	0
Sunshine Coast	22	2	0
Gympie	78	13	0
Melbourne	30	10	2
Bendigo	47	13	2
Mildura	75	30	5
Wodonga	70	18	2

In summary:-

- SEQ has earlier sunrises and sunsets than Victoria in summer
- SEQ is not hotter than Victoria (see page 4 for a discussion regarding the effect of humidity in the SEQ region)
- SEQ is more suited to daylight saving than Victoria

TWO TIME ZONES IN OTHER REGIONS

Twelve of the larger states in the USA ranging from Florida to Oregon have two time zones (Figure 2).

***Figure 2**: The whole of **Tennessee (TN) and Kentucky (KY)** are not suited to either the Eastern or Central time zones and therefore utilize the two time zones almost equally. The **Florida (FL)** panhandle in the northwest (largest city Pensacola) is better suited to the Central time zone rather than the Eastern time zone utilized by the rest of the state (including the capital Tallahassee).*

Five of the ten provinces of Canada utilize two time zones (Figure 3 and 4).

***Figure 3**: The southeastern corner of **British Columbia** is in the same time zone as Alberta (Mountain time zone) rather than the Pacific time zone like the rest of British Columbia*

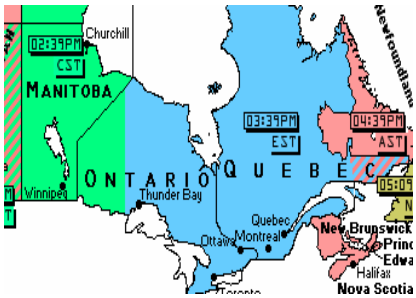


***Figure 4**: **Quebec** utilizes the Atlantic and Eastern time zones while **Ontario** utilizes the Eastern and Central time zones*

A ***Google*** search (*two time zones + name of state/province + controversy / debate / argument*) could not find one reference to any controversy with regard to two time zones in one state. Indeed, in one article about Indiana the authors remark **that in the USA there seems to be a remarkable lack of controversy with regard to two time zones in one state.**

On the other hand state wide daylight saving is divisive and controversial around the world. This is due to the fact that the western part of a region already has a moderate daylight saving effect and an additional hour of daylight saving is not necessary and is opposed by the residents in that region.

DAYLIGHT SAVING AND CLIMATE IN SEQ

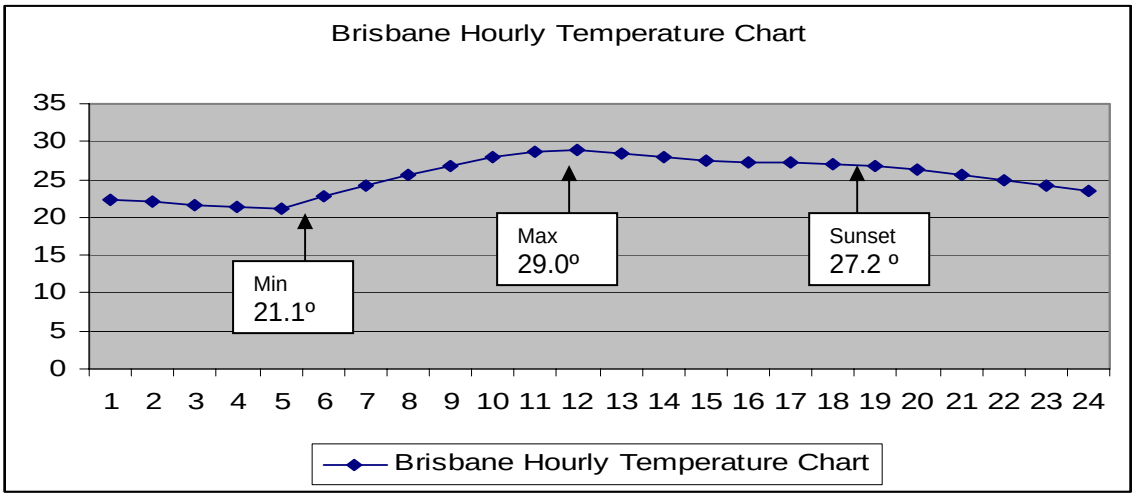
The **Gold Coast** has 30 days with a temperature of above 30 degrees (including two above 35 degrees), **Toowoomba** 28 (3) and the **Sunshine Coast** 22 (2). At sunset the temperature drops relatively slowly due to the humidity especially along the coast.

In summer the difference between the minimum and maximum temperatures is only 8ºC. At sunset **the temperature is about 2°C below the maximum and then drops by about 0.8°C per hour for six hours after sunset**. On very hot days it would still be hot until late at night **with or without daylight saving (see Table 4).**

By contrast, **Melbourne** has 31 days with a temperature of above 30 degrees (including nine above 35 degrees), **Adelaide** 40 (13) and **Perth** 70 (26).

SEQ with its moderate climate and eastern location is better suited to daylight saving than any other region of Australia. Even with daylight saving, sunrise and sunset will occur earlier than any other major centre in Australia.

This is not the case in NWQ. This region, located further west, already has a moderate daylight saving effect year round and does not need more daylight saving. The hot dry western part of the state cools down quickly after sunset (Mount Isa has 112 days over 35 degrees).



Time	***5am – noon***	***Noon – 7pm***	***7pm - midnight***	***Midnight - 5am***
Effect of daylight saving on hourly temperature	**1.0-1.2°C cooler**	**0-0.5°C hotter**	**0.7-0.9°C hotter**	**No difference**

Table 4**: **Mean hourly temperatures for Brisbane in January. It takes 7 hours for the temperature to rise 8ºC, stay around maximum for 2 hours and then 15 hours to drop back down to the minimum.

DAYLIGHT SAVING, HEAT AND CHILDREN RETURNING FROM SCHOOL

The table shows the **mean maximum, minimum and 3pm temperatures in Brisbane**. (Schools are closed for most of December and January and these figures have not been used in calculating the averages).

	Oct	***Nov***	*Dec*	*Jan*	***Feb***	***Mar***	***Average***
Mean maximum T°	**25,6**	**27,3**	28,6	29,1	**28,9**	**28,1**	**27,5**
Mean 3pm T°	**24,1**	**25,6**	26,9	27,6	**27,4**	**26,7**	**26**
Difference between 3pm T° and maximum T°	**1,5**	**1,7**	1,7	1,5	**1,7**	**1,4**	**1,5**

The maximum temperature occurs between 12pm and 1pm. The 2pm temperature will be about 0,5°C higher than the 3pm temperature.

With daylight saving children who return home at 3pm will return at the current 2pm temperature without daylight saving. This will only be 0,5°C hotter than the current temperature with an average temperature of 26,5°C.

Daylight saving will therefore have very little effect on the temperature when children return home from school.

BUSINESS AND TWO TIME ZONES

There is a common misconception that the business community is the prime mover for Queensland to adopt daylight saving. It is in fact the people of southeastern Queensland, most of whom do not care what the time is in Sydney or Melbourne.

According to the **Queensland Chamber of Commerce**, 85% of the business community in SEQ wants daylight saving although only 50% said their business had suffered due to the time difference with the southern states. Only 50% of the business community in the rest of Queensland wants daylight saving while less than 30% said their business had suffered due to the time difference with the southern states. ***(Ref: Queensland Pulse Newsletter Dec 2005)***. This simply reflects the view of the people in each of their regions and it is not surprising that each business community supports that regional view.

The argument that two time zones would shift a Queensland/NSW problem to an intrastate problem has some merit but is insignificant when compared to the lifestyle, energy and road safety benefits that the people in SEQ would immediately have.

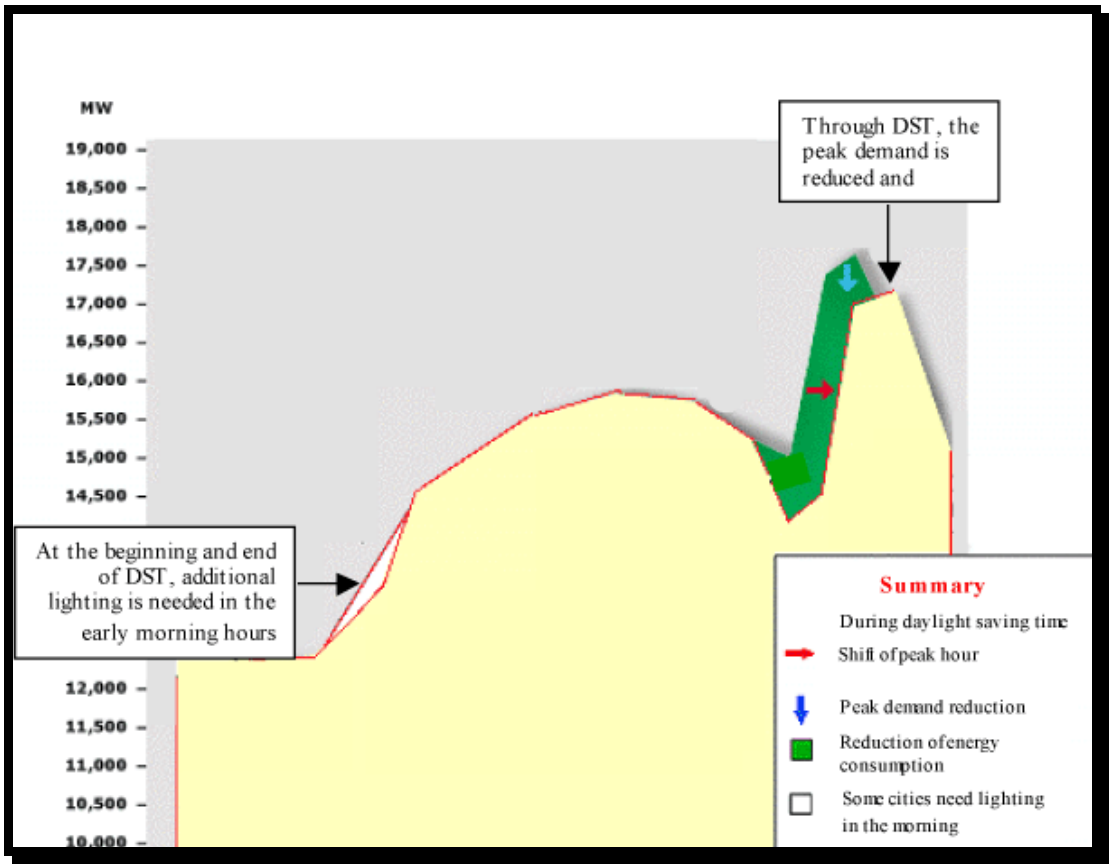
One time zone for Queensland business may be convenient but it is not essential. In other parts of the world any inconvenience of having two time zones in one state is easily adapted to and accommodated. **Premier Beattie himself has often stated that business in the 21st century should have no trouble in dealing with business outside of their time zone.**

DAYLIGHT SAVING AND ENERGY IN SEQ

Studies from **California** (2001), **Mexico** (2003) and **South Africa** (2006) show that daylight saving in summer at similar latitudes to SEQ saves energy.

SEQ with its eastern location is better suited to and will derive more energy benefit from daylight saving than any other region of Australia.

This graph shows **Mexican electricity consumption** showing use of electricity before and after daylight saving was introduced.



NOTE:

- Total consumption is reduced
- **More important, the peak demand is reduced**. This decreases the chances of black outs and reduces the need for extra capacity requirements.
- A very small increase in morning consumption. The sun actually rises quite late in Mexico compared to SEQ and this small increase is unlikely to occur in SEQ. It would probably occur in Western QLD if daylight saving was introduced there.

Studies from **Victoria** (2007) and **California** (2007) show that daylight saving in winter makes no difference. This is to be expected as there is no underutilized light in the morning to be saved for use later in the day.

DAYLIGHT SAVING AND ROAD SAFETY IN SEQ

Road safety in Queensland has become a major issue. There are numerous studies from 1995 to 2007 that show that extra light in the early evening ***significantly decreases vehicle occupant and especially pedestrian fatalities***.

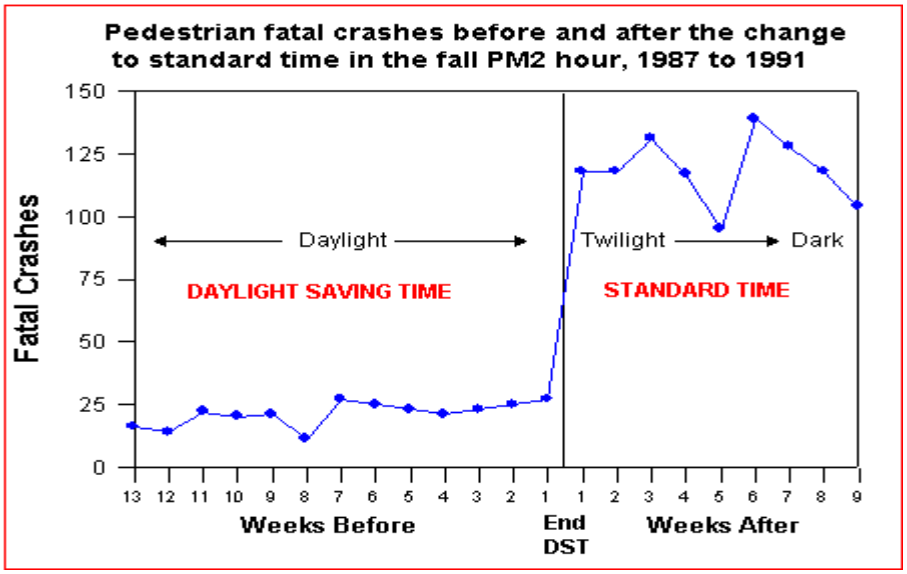
The **latest study "Short and long term Effects of Daylight Saving Time on Fatal Automobile Crashes."** was published in February 2007 in *The B.E. Journal of Economic Analysis and Policy* (Vol. 7, Issue 1, Article 11). The abstract of the study (www.bepress.com/bejeap/vol7/iss1/art11) states:

1. ***DST has no significant detrimental effect on automobile crashes in the short term;***
2. ***DST significantly reduces automobile crashes in the long term with an 8-11% fall in crashes involving pedestrians, and a 6-10% fall in crashes for car occupants in the weeks after the spring shift to DST."***

Apart from poorer visibility in the early evening, there are also recent neurophysiological studies showing that **reaction times are slower in poor light**. **The longer reaction time translates into significantly increased stopping distances or time taken to initiate avoiding action.**

2003 Queensland Transport statistics show that the fatal accident rate peaks in the late afternoon/early evening and that most of the fatal accidents (75%) occur in southeastern Queensland. This region would benefit by shifting the first hour of light when few cars are on the road to the evening when the traffic is heavier.

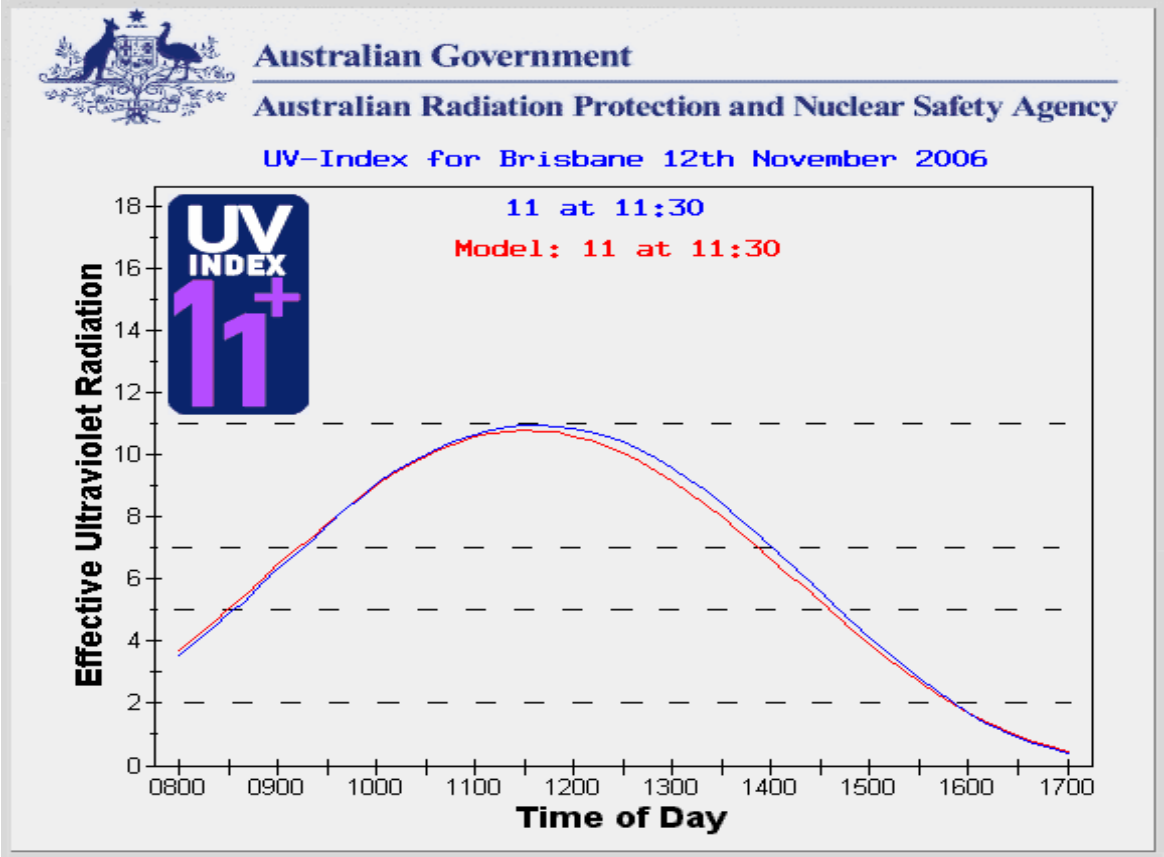
The road safety issue alone is a strong argument for introducing daylight saving to SEQ. Apart from a decrease in fatalities and injuries, there will be savings to emergency (police, ambulance and fire brigade) and hospital services.



In 1995, an article in the American Journal of Public Health showed that in the USA from 1987 to 1991 the weekly pedestrian fatality rate in the hour ending at sunset was less than 25 in the 13 weeks before the end of daylight saving and rose to over 100 in the 9 weeks after the end of daylight saving.

DAYLIGHT SAVING AND UV EXPOSURE IN SEQ

SEQ because of its early solar time has the same UV index value at 8:00am and 3:00pm. **At present, school children in SEQ are therefore exposed to the same levels of UV on their way to school as when they return from school.**



0 – 3 Low	3 – 6 Moderate	6 – 8 High	8 – 11 Very High	11 – 15 Extreme

Daylight saving would shift the UV index curve to the right which would cause less UV exposure on the way to school and more UV exposure on returning from school. The curve is flatter in the early afternoon so this would result in a slight net increase in daily UV exposure while going to and from school (***Table 5***). However with daylight saving any outdoor activities at school before 12:45pm would result in less UV exposure (***Table 6***).

***Table 5*: UV Index with and without daylight saving in Brisbane in November**

Time	8:00 – 8:30am	2:30 – 3:00pm	Combined Average
No daylight saving	4,0 – 5,5	5,5 - 4,0	4,0 – 5,5
Daylight saving	2,0 - 3,0	8,2 - 7,0	4,5 – 5,6

School children would have less UV exposure with any morning outdoor activities. This would especially benefit the Saturday morning sports activities and Nippers on Sunday mornings.

School children in SEQ would therefore probably have no change in UV exposure with daylight saving.

Tradesmen and other outdoor workers in SEQ would have less UV exposure before 12:45pm with daylight saving. After 12:45pm, workers would have a higher UV exposure but as most outdoor workers have more working hours before 12:45pm there would be a net decrease in UV exposure (***Table 6***).

***Table 6*: UV Index with and without daylight saving in Brisbane in January**

Time	6:00 – 7:00am	7:00 – 8:00am	8:00 – 9:00am	9:00 – 10:00am	10:00 – 11:00am
No daylight saving	0,5 – 2,0	2,0 - 4,0	4,0 – 6,2	6,2 -9,1	9,1 -11,8
Daylight saving	0,1 – 0,5	0,5 – 2,0	2,0 – 4,0	4,0 – 6,2	6,2 – 9,1

UV exposure for early morning and late afternoon outdoor activities would be unchanged with daylight saving (***Table 7***).

***Table 7*: UV Index with and without daylight saving in Brisbane in January**

Time	6:00 – 7:00am	7:00 – 8:00am	4:00 – 5:00pm	5:00 – 6:00pm	6:00 – 7:00pm
No daylight saving	0,5 – 2,0	2,0 - 4,0	2,0 – 0,5	0,5 – 0,1	0,1 - 0
Daylight saving	0,1 – 0,5	0,5 – 2,0	4,0 – 2,0	2,0 – 0,5	0,5 – 0,1

Sun protection (hat, clothing and F30 sunscreen) decreases UV exposure by 97%. This would effectively negate the clinical effect of any slight increase or decrease in UV exposure.

Sun protection is far more important than any slight increase or decrease in UV exposure that would occur as a result of daylight saving. There is no scientific evidence that daylight saving increases or decreases the incidence of skin cancer.

SUMMARY

South-eastern Queensland is ideally positioned to benefit from daylight saving.

Its **solar time and moderate climate** are suited to accommodate an hour of daylight saving. There will still be enough light for early morning with twilight starting between 5:15am and 6:15am and evening twilight will still end relatively early between 7:15pm and 8:15pm.

Two time zones work well in many other regions of the world. In Queensland there is a natural dividing line through a sparsely populated region northwest of Gympie and Toowoomba.

SEQ will benefit by a **decrease in energy consumption.**

The **road safety benefits are significant for SEQ** and can not be ignored any longer.

The concerns expressed about **increased air-conditioner use, UV exposure, skin cancer rates and afternoon heat for children returning from school** are not supported by the data.

Daylight saving outside of the SEQ region is inappropriate as the rest of Queensland already has a mild to moderate daylight saving effect year round. There is not enough surplus light in the morning that can be shifted to the evening. **The road safety and energy benefits will therefore be minimal.**

"Regional daylight saving certainly has a lot of benefits and sooner or later I think we have to seriously consider how we ensure the people in south-east Queensland get those benefits"

Jeff Seeney, ABC News 4 October 2007 (*two days after Premier Bligh's decision*)