RYE PARK: TURBINE SHADOW FLICKER

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I have identified two problems to do with turbine shadow flicker, with the Rye Park wind farm submission. They are:

- the Department of Environment and Planning supports a pro-developer policy on shadow flicker
- the developer, Trustpower, commits to assessing shadow flicker in one way, then changes tack

In May 2016 Trustpower made a clear commitment. It advised that at the design stage, they would ensure that the development:

"Does not exceed the EPHC Draft National Wind Farm Development Guideline limits for shadow flicker;"

At the same time, we know that in NSW there are currently no *legislated* guidelines on which to assess shadow flicker generated by wind turbines.
The NSW Wind Farm Guidelines (Draft) say:
"The impact of 'shadow flicker' from wind turbines on neighbours' houses within 2 km of a proposed wind turbine should be assessed. The shadow flicker experienced at any dwelling should not exceed 30 hours per year as a result of the operation of the wind farm. Specialist modelling software should be used to model shadow flicker impacts prior to the finalisation of the turbine layout."

So we have two distinct processes going on here: shadow flicker ***experienced*** and shadow flicker ***modelled***. It is important to separate these processes.
The exceedance measurement is totally at odds with the EPHC Draft National Wind Farm Development Guidelines as we shall see.

Where did this limit of 30 hours of shadow flicker ***actually*** experienced by residents come from? Victoria apparently. The Victorian guidelines (2016)[1] say:

> "The shadow flicker experienced immediately surrounding the area of a dwelling (garden fenced area) must not exceed 30 hours per year as a result of the operation of the wind energy facility."

Where did the Victorians get the 30 hour figure from?
And why did the Victorians assign the 30 hour limit to the ***actual*** shadow flicker measurement?
And why does the NSW Department of Environment and Planning accept the Victorian definition when it is at odds with the National Guidelines? While I look forward to the day these questions are answered, it is tempting to assume that in NSW the more lenient

[1] http://www.dtpli.vic.gov.au/__data/assets/pdf_file/0011/231779/Policy-and-Planning-Guidelines-for-Development-of-Wind-Energy-Facilities-in-Victoria_January-2016.pdf

Victorian definition was chosen because the government wanted to support the developer, given the State Significant Development of industrial scale wind turbines.

MODELLED versus **ACTUAL** shadow flicker annual limits.

Shadow flicker models typically make assumptions and simplifications.
For instance from the Biala LVIA:

> "The model also makes the following assumptions and simplifications:
> - There are clear skies every day of the year;
> - The turbines are always rotating;
> - The blades of the turbines are always perpendicular to the direction of the line of sight from the location of interest to the sun.
> These simplifications mean that the results generated by the model are likely to be conservative."[2]

The output of these types of models that do not take into account issues as above is a ***modelled*** measurement.
If, in addition, the above factors are included, the result will be much closer to an ***actual*** measurement. (In this day and age of high tech wizardry, why there isn't a sophisticated model that takes all these factors into account remains a mystery)

Relationship between **MODELLED** and **ACTUAL** annual limits.

The Draft National Wind Farm Development Guidelines (the ones that Trustpower promised to abide by) nominate the relationship[3]:

Table E-1
Recommended exposure limits

Impact	Measure	Assessment procedure	Acceptable Level
Annoyance	Hours / year (hr/yr)	Modelled*	30 hours / year modelled
		Measured*	10 hours / year actual

* Calculation of shadow flicker in an ideal model (with the assumptions specified here) will provide a conservative estimate of the actual shadow flicker. In most circumstances where a dwelling experiences a 'Modelled' level of shadow flicker less than 30 hours per year, no further investigation is required. However, if this level is exceeded in the modelled scenario, mitigation measures may be introduced and the 'actual' or 'measured' level of shadow flicker will need to be determined. The modelling approach includes a number of assumptions and, as such, the 'Modelled' exposure limit is set higher to account for these conservatisms. The assumptions used in the modelling approach should produce an outcome equivalent to 10 hours per year actual exposure.

In summary, a residence with a ***modelled*** assessment procedure impacted for 30 hours per year is likely to experience an ***actual*** impact of 10 hours per year, and therefore 10 hours per year should be the acceptable level of exposure in actuality.

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[2] DNV-GL Biala Shadow Flicker and Blade Glint Assessment, p8
[3] Draft National Wind Farm Development Guidelines, p153

The above is supported in other jurisdictions.

> "By far the most comprehensive and well researched regulations are implemented in Germany. These are described in German Ministry for Environment and Climate Change (2002). These regulations included detailed limits:
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> - 30 hr/yr and 30 min/day modelled shadow flicker
> - 8 hr/yr actual shadow flicker"[4]

The Danish/Swedish regulations allow an ***actual*** number of shadow flicker hours per year of 10.[5]

Locally, DNV-GL and its predecessor companies have been consistently supporting the Draft National Guidelines in its shadow flicker assessments eg. Biala and Crookwell 3 are NSW examples (and we assume so too will Jupiter).
DNV-GL clearly understands the difference between ***modelled*** and ***actual*** acceptable levels. Victoria and the copycat States are some of the few jurisdictions that don't.

So how does all of this play out in the Rye Park scenario?

Having assured us that they would adhere to the Draft National Guidelines which clearly support an exposure limit of 10 hours per annum, Trustpower obviously didn't like the results of their modelling.

In table 8-4 they relapsed:

> "The results show compliance with the Victorian Guidelines of 30 hours/year at all nearby residences except for two (Dwellings R46 & R30). For both of dwellings R46 and R30 are associated with the project and have been consulted with, and accept, potential shadow flicker impacts."

In addition to residences R46 & R30, there were 7 residences with exposures of over 10 hours per annum after turbine orientation and cloud cover were taken into account.

<u>Final Comments</u>

We understand the Department is rewriting the Visual Impact section of its draft wind farm guidelines. When it comes to the Shadow Flicker topic, it is advised to broaden its research to jurisdictions of greater knowledge and experience than Victoria. A ***theoretical*** exposure limit of 30 hours per annum coupled with an ***actual*** exposure limit of 10 hours per annum would not be a challengeable outcome.

Trustpower can't have it both ways. They either abide by the Draft National Guidelines or the Draft NSW Guidelines. They can't selectively use either when it suits without giving a clear impression of being misleading and deceptive.

We agree with the Draft National Guidelines when they advise that:

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[4] Draft National Wind Farm Development Guidelines, p150
[5] Draft National Wind Farm Development Guidelines, p157

> "Shadow flicker is very sensitive to turbine position. Micro-siting, even within the limits allowable for an approved development application, can significantly change the duration of shadow flicker at some locations. Following micro-siting, shadow flicker should be reassessed."

Shadow flicker must also be modelled for properties "**including approved but not yet developed dwellings or subdivisions with residential rights**", otherwise the Department may be buying some trouble down the line.