



25th July 2013

Mahani Taylor

Director, NSW Section,
South-Eastern Australia Environmental Assessments
Department of Sustainability, Environment, Water, Population and Communities

Via email: mahani.taylor@environment.gov.au

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Dear Mahani,

RE – Capital Solar Farm – Response and Provision of Additional Information (EPBC 2011/5865)

This letter is intended to respond to the letter received dated 5 March 2013 and to further progress the assessment of the Capital Solar Farm project by SEWPaC.

The Proponent maintains that it and its consultant, NGH Environmental, has taken a conservative approach in assessing the potential impact to Native Temperate Vegetation on the development site due to the proposed works and that no further assessment or additional impact is justified.

The Proponent does not accept the suggestions presented in the letter that 100% of the development envelope (under and around the solar PV array) will experience a significant impact due to the installation of the proposed works, or that major changes will occur to the micro-climate in the vicinity of the installation. These suggestions are:

- not supported by any factual basis or precedent;
- inconsistent with experience from numerous large scale solar PV installations globally;
- inconsistent with the nature and configuration of the proposed works (a large amount of space surrounds each solar PV array structure behind, in front and underneath – see appendix for further details);
- not supported by any logic related to the expected impacts from the proposed works on ground vegetation (in fact the suggested changes to micro-climate seem counter intuitive);
- contrary to expert advice we have received and presented that has been informed by over 3 years of assessment of the project, potential impact of the proposed works and species composition and condition of the development site;
- contrary to the approach that has been accepted by NSW Office of Environment and Heritage (OEH) as a conservative means for assessment of the potential impact (see further below); and
- does not recognise the significant potential for management activities to in fact improve the quality and extent of Native Temperate Grassland at the site

(especially given the current state and recent damage to the majority of the NTG at the site).

The Proponent also does not accept that the precautionary principal is applicable in this instance. Application of the precautionary principal resides on the premise that there must be a plausible risk as a consequence of the proposed action. In this instance, there is no logical, empirical or anecdotal rationale provided to support a suspected or plausible risk above and beyond the conservative assessment we have applied as to the possible impact (in fact again, the logical argument presented regarding micro-climate effects are counter intuitive as discussed further in the appendix). Specifically, the precautionary principal is not intended as a means or justification to impede any new action or policy just because all consequences cannot be known in advance – this would be reductionist and would render this important principal irrelevant. It does seem ironic in a sense that by contrast, the precautionary principal has been suggested as a justification for impeding the proposed project, when in fact the primary objective of the project is to provide a source of renewable and sustainable energy, an important means by which to counter anthropogenic climate change, a phenomena to which the precautionary principal undoubtedly applied (until scientific evidence became more conclusive).

Since the Proponent last provided documentation to SEWPaC, the following relevant events have occurred:

- Mark Jenkins, Project Manager at SEWPaC, attended a site visit in order to better understand the quality of the vegetation at the site, the proposed development and the potential impacts of the solar PV array.
- The Proponent and their consultant, NGH Environmental, have consulted closely with NSW Office of Environment and Heritage (OEH), including two sites visits, regarding the proposed methodology for assessing the potential impact of the solar PV array on the vegetation at the development site. OEH have confirmed that they now accept the assessment methodology previously proposed by the Proponent on the basis that it has been demonstrated to represent a conservative approach.

We have also provided more detailed responses and summaries in the appendix to this letter related to the 5th March 2013 letter, the SEWPaC site visit and OEH's accepted assessment methodology.

Given the information outlined herein, we request that SEWPaC reconsiders the position taken in the 5th March 2013 letter and provides a direction to publish preliminary documentation and progress consideration of the proposal on the basis of the assessment conducted and presented to SEWPaC previously (for clarity, that is the assessment methodology that ensures a conservative approach by assuming a total impact (removal) is experienced by 38.44% of the vegetation within the development envelope).

The proposed Capital Solar Farm is:

- strategically justified through its objectives to increase the supply of renewable and sustainable energy into the National Energy Market and

contribute to a transformation from a fossil fuel based system to a renewable based one;

- has been sited appropriately and sympathetically to the many overlaying planning considerations such as land use, biodiversity and community considerations; and
- a rigorous and extensive assessment has been undertaken over many years to understand any residual impact to biodiversity and formulate offset and management plans accordingly.

The Proponent is looking forward to recognition of such and acceptance of its wholesome approach so that it can proceed to deliver this critical project to Australia's future and the environment without further and undue delay.

If you have any further questions regarding this letter please do not hesitate to contact me, otherwise I look forward to a response at your earliest convenience.

Yours sincerely,



Chris McGrath
Development Manager

Appendix:

A. Potential Impact Assessment Methodology

The Proponent and NGH have consulted closely with OEH over the past months in order to progress and settle an appropriate method for assessing the potential impact of the proposed works on the existing vegetation at the development site.

The Proponent and NGH has maintained from the outset that the proposed methodology, of assuming 100% impact to the area of vegetation under the area equivalent to the 38.44% in reduced irradiance on the ground cover, is conservative compared to alternative approaches of either assessing impact only on the area relating to the ground coverage of the array itself (30%) or assessing a degree of impact to 100% of the land within the development envelope (ranging from negligible to moderate impact).

During the further consultation with OEH, NGH conducted further permutations of the impact assessment with alternative approaches in order to support claims that the applied methodology is conservative by comparison. The main alternative approach tested was to consider that 100% of the area within the development envelope causes some form of impact on the vegetation and apply a degree of impact to that land ranging from negligible to moderate impact (corresponding with the spectrum of impacts from being under the array and shaded permanently to being between the array rows and only shaded during limited hours of the year).

In the context of this further analysis conducted, OEH have re-assessed the proposed methodology and have provided confirmation that they now consider it an acceptable methodology and it represents a conservative approach. Please refer to the extract below to this effect from an email from John Briggs, Project Manager, NSW OEH on 17th July 2013:

I write to confirm that OEH supports the approach of your consultant NGH in assuming for the Capital Solar Farm proposal that there will be a total loss of vegetation/habitat within the track and inverter footprints and a total loss of vegetation/habitat that lies directly under the solar panels. Under the proposed design NGH has calculated the loss due to the panels to equate to 38.44 % of total area over which the panels will be placed. The assessment will then assume there is no negative impact on the grassland vegetation/habitat between the solar panels.

OEH supports the above approach to calculating the impact of the development, as there is currently insufficient monitoring data available to forecast what the net impacts of the solar panels will be on the grassland beneath the panels. There will no doubt also be some impact on grassland between the panels, but again there is insufficient monitoring data available for the net impact to be quantified. Thus, the approach outlined above and that has been adopted by NGH seems the most practical and reasonable method available to assess the impacts of the proposal on the grassland vegetation.

B. Further Response to Letter dated 5th March 2013

The Proponent is concerned that the suggestions and assertions made in the letter regarding the potential impact of the proposed works on the micro-climate in and around the array are misplaced and intuitively incorrect.

More specifically:

- It is counter intuitive to suggest that the area under the solar PV array will experience increased heat and therefore increase evapo-transpiration. The nature of a solar PV array is such that it causes a degree of shading on the ground cover beneath it which immediately would suggest lower temperatures, not higher temperatures. Secondly, solar PV modules convert approximately 15% of the sunlight falling on them into electricity, therefore application of the law of conservation of energy suggests that there is less energy retained in the climatic system, once again refuting the claim of higher temperatures.
- The risk of increased evapo-transpiration and moisture stress due to these increased temperatures follows on from above and is obviously not applicable if it is accepted that the risk of increased temperatures is erroneous.
- The suggestion that rain will 'pool' after falling off the panels is not supported by a sound understanding of the terrain and ground characteristics at the site. Rain will still fall directly on approximately 70% of the ground area within the area, being the area not covered by the solar PV array. Rain falling directly on the 30%, being the solar PV array, will then fall from the front edge of the array, however the terrain at the site enjoys the benefit of good natural drainage and the rainfall would then run-off the site and permeate into the soil as per any other previous rainfall. In effect the rainfall will have been offset from its original location by no more than a few metres.

C. SEWPaC Site Visit

Mark Jenkins met with myself and Brooke Marshall and Dave Maynard from NGH Environmental at the Capital Solar Farm site on the 7th March 2013. The purpose of the meeting was to provide SEWPaC the opportunity to better understand the quality of the vegetation at the site, aspects of the proposed development and the potential impacts of the solar PV array, in order to better inform the assessment being undertaken.

The meeting involved discussions regarding the potential for on ground impacts of the solar PV array on the Natural Temperate Grassland (NTG) community on the site. It involved inspecting the project site as well as a small existing demonstration panel and discussing the some of the potential effects of the array, such as shading and other alterations to microclimate.

Key issues discussed at the meeting included:

- Outlining the large ~7m gap between the rows of solar PV modules and the space around and under each array.
- The low physical coverage ratio of the solar PV modules compared to the development site (~30%).
- Effectiveness of weed and grazing management to maintain (if not improve) the quality of the NTG community at the site.

Additionally, the summary below provides further relevant background information that was discussed verbally during the site visit (most of which is presented in the Environmental Assessment for the project).

D. Further Discussion on Potential Impact on NTG

Area of impact

The development site (areas where solar farm infrastructure would be developed) is located on farmland adjacent to the existing Capital Wind Farm and substation. Infrastructure components include the solar photovoltaic array over an area of approximately 80 hectares, with associated electrical infrastructure, maintenance facilities, access tracks and minor upgrades to adjacent roads. Initially a broad 'development envelope'¹ was assessed to allow some flexibility in avoiding identified constraints when locating infrastructure. The proposal was subsequently modified to avoid areas of constraint. For the purpose of the assessment however, only the final 'infrastructure footprint'² is assessed. The land is currently subject to intense grazing and is generally in poor condition³.

Degree of impact

The PV panels represent a large proportion of the development site. The area under and between the panels at the Capital Solar Farm will be maintained as native pasture to assist in minimizing the potential for erosion, rather than being graveled or otherwise modified.

The array would be mounted above the ground on pylons (drilled, not excavated footings) with spacing between arrays for access and maintenance. The modules will be mounted approximately 0.7m to 3 m above the ground on an approximate 30 degree angle. Little direct impact is expected for installation of the modules.

Operational impacts of altered microclimate are of most relevance with regard to NTG. The arrays would result in a matrix of array to pasture areas; arrays would be approximately 4m wide and 50m long, the intervening pasture areas would be 7m wide and 50m long. Tracks are located only at the end of each 50m module. Tracks would not be located within the 7m clear space between the array rows. This would be maintained as native pasture and would likely persist in its current state which is considered to comprise NTG.

Alterations to microclimate

Considering the angle of the arrays, with the minimum height to the north, the maximum height to the south, under normal conditions, most rainfall would be deposited to the immediate north of the panel and least rainfall would reach under the centre of the array rows (some moisture would reach this area in moderate to heavy rainfall events via run-on, infiltration and capillary actions, and none during light rainfall events). There would be little effect in the 7m grassed gap between panels. The soil is known to be sandy and free draining. It is expected that this would assist to even out the differences in soil moisture in the matrix.

¹ Development envelope: areas in which infrastructure may be located; a broad envelope developed in the early stages of the design process.

² Infrastructure footprint: areas in which infrastructure will be located; a smaller area reflecting the final stage of the design process.

³ This has been established in a detailed condition assessment, using control plots and recognised grassland survey techniques; **ng**henvironmental 2011a.

Similarly, considering the shading effect, there would be a gradient from zero sunlight (total shadow) under the centre of the panel, reaching a maximum insolation north of each panel, the area that would be unaffected by shading. In terms of quantifying the shading impact, a shading analysis of the array area was undertaken by Suntech to verify the extent of shading impacts under the array. This analysis concluded that:

- The reduction in total irradiation onsite, as a consequence of the solar array would equate to 38.44% of the array area.
- With regard to what would be in permanent shadow, this would be a much reduced figure of 15.75%.

With respect to alterations in temperature under the array, studies by the University of California, San Diego (UCSD 2013), have shown that solar panels on the roof of a house actually create a cooling effect, particularly when there is an air gap between the panel and the roof. This is due to the fact that the panels absorb a proportion of the heat energy from the sun and this is removed by air circulation around the panels. The panels reduced the amount of heat reaching the roof by 38%. Given that the panels will be elevated from the ground with air free to circulate within the array area, a reduction in temperature beneath the array is expected, particularly during summer.

Based on the information above, effects are assumed as follows:

- The amount of soil moisture evaporation will be reduced beneath the array. The shading, reduced wind and lower temperature expected beneath the panels will result in a slowing of plant evapotranspiration and soil moisture loss to the atmosphere. A beneficial impact is anticipated in this regard.
- The shading will affect species composition beneath the array; some species will benefit and become more prevalent, some species will decline. C4 grasses known from the site (including Kangaroo Grass *Themeda australis*, Red Grass *Bothriochloa macra* and Windmill Grass *Chloris truncata*) require more sunlight to drive photosynthesis than C3 grasses and may decline or disappear from under the array. The more shade-tolerant C3 grasses (including Wallaby Grasses *Austrodanthonia* spp., Spear and Corkscrew Grass *Austrostipa* spp., Wheat Grass *Elymus scaber*, Weeping Grass *Microlaena stipoides* and Hairy Panic *Panicum effusum*) may come to dominate the pasture cover under the array.

As the NTG community shows a very similar composition to the open woodland understory adjacent to the site, the change in composition is not expected to be high in those areas subject to partial shading but could be notable in areas exposed to permanent or lengthy shading periods. The C3 grasses, Spear and Corkscrew Grass, currently dominate the NTG community at the site. The other C3 grasses mentioned above form a lesser component of the community. These species have a greater chance of persisting under the array. Red Grass and Windmill Grass also form a lesser component of the community and may decline under the more heavily shaded areas but would persist in less heavily shaded areas particularly the 7m inter row space between the array rows. Except for the areas in permanent shade, it is considered unlikely that the species composition would change to the extent that the grassland at the site would no longer be considered to be representative of the NTG community that currently occurs at the site.

The effect of these conditions on plant growth is expected to produce an area of increased growth along the northern edge of the array, where greatest moisture and sunlight coincide, creating a 'swale effect' that would assist in trapping moisture and preventing soil erosion where the rain is deposited with most velocity at the front of the panel. Least growth would be expected in the area of total shadow (approximately 15% of the array area) and least soil moisture directly under the panel. Slightly reduced growth is anticipated in other areas that would be subject to slightly less direct rainfall and sunlight.

The schematic in Figure 1 shows the expected pattern of growth in relation to the panels.



PLAN VIEW

Panel modules run 50m east to west, and are 6m wide. The intervening pasture area would be 7m wide.

SECTION VIEW

Increased growth is expected north of each panel. Least growth and the highest risk of pasture loss, is expected directly beneath the panel, equating to 15% of the array area which will be in permanent shadow.

Weed and grazing management

The project description, as described in the 2010 Environmental Assessment, states that panels will be fenced via a perimeter fence and that the pasture growth will be controlled by grazing or slashing. A commitment of the project, carried over into the consent conditions, is a groundcover management plan for the under panel areas, aimed at controlling weeds and maintaining native pasture and addressing erosion. Hence, it has been assumed that:

- Weeds will not increase under the arrays. Weeds are more likely to reduce than remain static, given the implementation of this plan. Given the poor condition of the NTG at the site due to the process of weed invasion, weed control would reduce the level of threat to the NTG at the site from this process.

- Percentage ground cover will not reduce significantly under the arrays. A ground cover management plan forms a part of the conditions of consent to ensure that ground cover persists to prevent erosion and also to minimise operational impacts on native pasture (and consequently NTG). The areas of NTG within the proposed array area are currently exposed to intense grazing pressure which has resulted in degradation to the community, particularly from a loss of species diversity. Grazing would be managed as part of the groundcover management to maintain a minimum level of biomass within the pasture and prevent overgrazing. This would also contribute to improving the quality of the NTG at the site that would not be directly impacted by the proposal.