Senate Standing Committee on Environment and Communications
Legislation Committee
Answers to questions on notice
Environment and Energy portfolio

Question No: 198

Hearing: Budget Estimates

Outcome: Agency

Program: ARENA

Topic: Independent reports

Hansard Page: 25

Question Date: 23 May 2017

Question Type: Spoken

Senator Xenophon asked:

Senator XENOPHON: Are you aware of any independent analysis or reports being carried out in relation to the project?
Mr Frischknecht: Yes, as has been reported in the media, which alluded to some reports being conducted by the council.
Senator XENOPHON: On notice, could you provide copies of those reports that ARENA may have, in the sense that they may not be publicly available in relation to that or at least take that request on notice in respect of those reports?
Mr Frischknecht: Yes, I will take that on notice.

Answer:

The District Council of Coober Pedy (DCCP) engaged Resonant Solutions to provide advice on and prepare reports in relation to the EDL Coober Pedy Hybrid Renewable Diesel Project. The DCCP provided ARENA with copies of the three reports prepared. The first was prepared and provided to ARENA in 2015 and the other two were prepared and provided more recently in December 2016 and January 2017. The reports provided are as follows:

- Attachment A: Hybrid Energy Summary Review for Coober Pedy Council (2015)
- Attachment B: Report and Recommendations on the Renewable Hybrid Project for Coober Pedy Council (2016)
- Attachment C: Costing Overview of the Coober Pedy Renewable Hybrid Project (2017)

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968

213 Greenhill Road
Eastwood
SA
5063

Tel. 08 8418 3892
Fax. 08 8274 3799
info@reson.com.au
www.reson.com.au

Energy, Project Management, Engineering

Hybrid Energy Summary Review for Coober Pedy Council

Client	:	**District Council of Coober Pedy**
Contact	:	**Tony Renshaw,**
Author	:	**Graham Davies**
Date	:	**03 December 2015**
Document	:	**RS/15/CP/04**
Purpose	:	**Draft Summary of Findings**

SUMMARY OF HYBRID ENERGY PROJECT FINDINGS

Resonant Solutions produced report cp-rep-15-03 for the District Council of Coober Pedy (DCCP) to report and provide recommendations on a proposed Hybrid Energy Generation system and associated Power Purchase Agreement (PPA) with Energy Generation Pty Ltd. This document is an extract from the report and is presented in simplified form in order to assist in conveying the gist of the formal report.

Resonant is aligned with DCCP and DSD in that all parties would like to see an iconic renewable hybrid project, reduced electricity tariffs, reduced RAES subsidies and ensure a sustainable Coober Pedy. However, Resonant is of the opinion that the contract with EDL is unlikely to achieve any of these aims. Resonant does acknowledge that the proposed technology is feasible, but believes it is sub-optimal.

Specific concerns and risks with the PPA are:

1. The PPA locks DCCP into an expensive ($6.7M p.a.) 20 year contract with no easy way to exit or decrease electricity prices.
2. With prices locked in at levels above metro Adelaide, DCCP would rely on SA Government (DSD) funding through the RAES to avoid insolvency;
3. With rapidly decreasing costs, it is highly probable that in 5 to 10 years, residents would defect from the grid for economic reasons under the PPA tariff regime. This would necessitate additional DSD support as they would have a bill of $4.7M even if no electricity was sold;
4. DCCP is also obliged to undertake roads, water, easements, circuit breaker upgrades, site licenses, generation licenses, which further increase their costs;
5. The proposed PPA caps all of EG's risks (outages, penalties) to the detriment of DCCP. It would benefit EG to have no renewables earn $9.5M in revenue and pay the capped penalty of $0.4M;
6. The contract is extremely complex to manage, has many ambiguities, inconsistencies, insufficient technical definitions and errors. See PPA markup.
7. The complexity of managing the contract would place a large burden on DCCP, and to even contemplate and Beneficial Change would incur substantial legal and other costs;
8. There is no economic incentive to ensure an efficient, flexible system that could take advantage of commercialising technologies and reducing costs of storage. Any benefit would have to be 'forced' through the Beneficial Clause;
9. The reported capital of $33M is excessive in the current market place, and may reflect a price of 18 months ago, but the market is moving fast;
10. It is currently a competitive market, and companies are prepared to trim profits to get work, yet no competitive process has been undertaken;
11. EDL have had no experience to date with any of the proposed renewable technologies including the DUPS, solar PV, wind, HV feeders. They do have diesel and control of diesel experience;
12. In a meeting, EDL acknowledged they had not considered demand management, load switching, smart meters, increased storage, capacitor banks, distributed solar (which reduces surges), distributed batteries. Given they claimed 1500 configurations, it is surprising that none of these were considered;

13. The proposed system wastes more than 30% of the renewable energy, a combination of items discussed above would could significantly improve this;
14. There is the very real risk that the system will only be commissioned in Dec 2019, as that is the date the Liquidated Damages kick in for late delivery. EDL have every incentive to delay the project, as they would be able to run more diesel, which is more profitable to EDL;
15. By the time the project is running, 70% diesel will no longer be iconic, particularly for a site with such good wind and solar resource as Coober Pedy;
16. To rely on the competence, public image and good will of EDL to ensure the project meets all criteria and does all it can to decrease electricity tariffs is a huge gamble;
17. EDL still have extensive design and project work to do including establishing site locations, systems specifications and sizing, and construction work is not imminent.

It is unfortunate, that the project has progressed this far, there will be further delays if the process goes back to the drawing board. There is also the risk of the ARENA funding being withdrawn. It is likely that a reconfigured less costly more profitable project with 100% renewables would very likely succeed in ARENA granting funds.

Resonant recognises the delay in the project and recommends the following:

1) Obtain quotes and initiate installing 100kW of solar PV directly into the 240V feeder under '13.6 Beneficial Change' of the current PPA contract. The payback for such a scheme is estimated as 1 to 2 years – using Simple Payback. It is also a chance to test the Beneficial Change clause;
2) Apply to ARENA for funding to undertake a feasibility study into a 100% Renewable Energy Project (REP) with integrated control and demand management with storage options including batteries, hydrogen, compressed air and other.
3) Initiate an Expression of Interest (EOI) to gauge indicative prices and technology available on the open market for a PPA and/or EPC (Engineer, Procure, Construct) for
    a. A comparative system of 70% renewables;
    b. An iconic 100% renewables with wind and solar at 90%+ and biodiesel for the remainder

We believe that Coober Pedy with its excellent and complimentary wind and solar resource is ideally placed to be a renewable showcase and hub. A flexible and robust system comprising 4MW of wind, 2MW of solar, 5-10MWh of storage using a commercially renowned integrated control system would cost less and provide reliable power. With the right degree of flexibility, options such as hydrogen, compressed air storage and flow batteries could be connected with minimal risk to the robust system in place.

The resourcefulness of the Coober Pedy community is already evident in their underground (sustainable) living, recycling water for the orchard, energy efficiency, reverse osmosis powered by solar PV and latest controls system; and this community could be the ideal mix for embracing the technologies of the future.

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968

Tonsley Innovation Hub
1284 South Road
Clovelly Park
5042

Tel. 08 8125 5637

info@reson.com.au
www.reson.com.au

Energy, Projects, Governance, Engineering

Report and Recommendations on the Renewable Hybrid Project for Coober Pedy Council (For Limited Public Release)

Client	**:**	**District Council of Coober Pedy**
Contact	**:**	**Fiona Hogan,**
Author	**:**	**Graham Davies**
Date (original)	**:**	**08 February 2016**
Date (redacted)	**:**	**12 December 2016**
Document	**:**	**RS/16/CP/01 Rev 1**

DOCUMENT SUMMARY

Document History

Doc Name	Rev	Date	Details	Author	Reviewer	Approver
RS/15/CP/03	A	03 Dec 2015	For Review	G Davies		G Davies
RS/16/CP/01	0	08 Feb 2016	For Issue	G Davies [redacted]	[redacted]	G Davies
RS/16/CP/01	1	12 Dec 2016	For Limited Public Issue	G Davies		G Davies

Important notes relating to changes:

Note1: Changes to the original 8 February have only been to remove information that is sensitive and identifies the specific vendors and or their confidential information. Actual Vendor names replaced with Vendor1, 2, 3. The material substance of the 8 Feb report remains.
Note2: Since writing the 8 Feb report, prices and charges have changed, however this does not change the materiality of the report.
Note3: Since writing the 8 Feb report, Resonant has received the Vendor 3 report, which indicates their charge rate could increase by 5c/kWh and capex is higher.
Note4: Resonant letterhead has changed to its new address.

Approved by:

Graham Davies (CPEng, GAICD, B.Sc Eng, M.Eng, NER)

Contributors

Besides the Authors and reviewers , a number of people have provided information that has assisted in compiling the report including Coober Pedy Councillors, CEO, DSD, EC and employees and colleagues.

File Name

CP-rep-16-01 Rev 1.docx

Confidentiality, Copyright and Disclaimer

Table of Contents

CRITICAL INFORMATION RELATING TO THIS REPORT

- **The purpose of this document is for limited public release in order to assist community stakeholders with information that may directly affect them.**
- **Permission to distribute this report is required by Resonant Solution, and the specific recipient(s) details provided to Resonant.**
- **The Original Document dated 8 Frebruary 2016 is the property of The District Council of Coober Pedy. If it is required to see this original, then this shall be arranged directly with DCCP, who would require an NDA or similar arrangement.**

EXECUTIVE SUMMARY

Resonant Solutions was engaged by the District Council of Coober Pedy (DCCP) to report and provide recommendations on the technical, contractual and commercial aspects of a proposed Hybrid Energy Generation Project (the Project) and associated Power Purchase Agreement (PPA) proposed by an Energy Company (EC).

Discussions and consultation with the Council, EC and the State Government (DSD) have occurred along with further industry research and market trends. The agreed intention of all parties is to provide reliable, lower cost electricity using renewable energy.

There is a current PPA in place between DCCP and a company which is due to expire in January 2019, thus to ensure continuous reliable power, a new PPA (and associated infrastructure) is required to be in place within 3 years.

EC have proposed a new 20 year PPA contract for Hybrid Energy to DCCP following EC's successful application to Australian Renewable Energy Agency (ARENA) for up to $18.5m in partial funding. The offer has been on the table for over 12 months and is due to expire within a few weeks.

Resonant Solutions has carefully considered the implications of signing the new PPA proposal, along with a number of associated contracts which include the Site Licence, the Termination Deed, and the SA Government Deed of Grant.

In the opinion of Resonant Solutions EC has presented a proposal that:

a) Is significantly more expensive to DCCP than other available commercial options;

b) Would significantly increase DCCP's reliance on the DSD for 20 years;

c) Could lead to grid defection within 5-10 years and a doubling of the kWh rate;

d) Places numerous other risks on DCCP;

and,

e) Has had minimal or no Transparency, Probity and Competitive Tension;

f) Appears to be sub-optimal.

Resonant recommends that the Council not accept the new proposed PPA from EC and instead put its requirements for electricity supply out to a commercial tender process. Resonant considers the proposal to be exceedingly expensive, highly risky to DCCP and damaging to the renewable energy reputation.

This opinion has been formulated based upon the following key facts:

a) EC is significantly more expensive than other available commercial options

- Budget proposals have been presented to DCCP from three reputable suppliers (Vendor1, Vendor2 and Vendor3) that suggest the commercial supply rate from a Hybrid Power Grid in Cooper Pedy could halve the average c/kWh rate based on the table below from Appendix 2.

- These other supplier options could represent an annual savings of $3.1m to $5.1m p.a to DCCP. This equates to a forecast saving of $85,000,000.00 over the 20 year life of the EC contract (present day value), without an ARENA subsidy.

	EC	Vendor1	Vendor2	Vendor3	
Total Capital	36	26	20	18	Million AUD
Ave sell rate	61	36	25	20	c/kWh
Total PPA cost p.a.	**7.5**	**4.4**	**3.1**	**2.4**	M$/a
SAVINGS PA	-	**3.1**	**4.4**	**5.1**	M$/a
TOTAL SAVINGS - 20yrs	-	**62.0**	**88.9**	**101.1**	M$ Note 1
Maximum Liability	**208**	TBD	TBD	TBD	M$ Note 2

- DCCP would pay circa EC $6.5m per annum for electricity by continuing with the existing PPA. Under the proposed PPA this payment will increase by $1.0m p.a. to circa $7.5m p.a. when the PPA becomes effective. The financial modelling (by EC) indicates that with a CPI of 3% and a real diesel increase of 2% (thus a nominal increase of 5%), the Project breaks even after 7 years when compared to diesel only. However no sensitivity analysis was presented. Resonant note that if the nominal increase of diesel were 4.1%, the project would not break even in 20 years. On this basis, there is no rush to implement the Project.
- The significant saving potential envisaged would substantially reduce the DSD RAES subsidy, and would benefit the Stage Government finances substantially.

b) Significant increase in DCCP's reliance on DSD for 20 years

If EG produce no renewable electricity then, despite the ARENA Grant, DCCP would be contractually bound to pay the higher diesel based PPA cost of $10.7m p.a. yet Liquidated Damages payable by EC for failing to supply Hybrid Power only amount to $400k p.a. DCCP would thus be charged a net of $10.3m p.a. indexed up over the life of the contract. This represents an increase of circa $4.7m p.a. over the current PPA. **This places a significant financial burden on DCCP, or DSD, if they agreed to cover this in its entirety.** The charge rates do not incentivise minimising diesel – in fact EC benefits financially by generating more electricity with diesel than renewables.

This situation could occur for any reason including:

- The Hybrid Power Plant not working as expected. Given that EC have no wind, solar or renewable integration experience this scenario is possible;
- EC deciding not to operate the Hybrid Power Plant for any reason;
- EC operating the plant such that all renewable energy generated is 'spilled', yet RECs (renewable energy certificates) could still be claimed.

DCCP do have a remedy to redress or exit the contract in the event that LDs have been exceeded under the Fundamental Breach clause, however this would place a sever burden on DCCP as it is a complex, lengthy and expensive process. Ultimately, to exit the contract would require DCCP to purchase the assets from EC at a Transfer Rate of around double their market value. Of course, the fact the assets were not working would mean their real value would be substantially less. To remedy this would require EC to pass on all knowledge of the SCADA and plant operations to a potential competitor. DCCP would thus be beholden to EC goodwill.

On the above basis, exiting and remedy redress are extremely difficult, and thus DCCP would likely be beholden to DSD for 20 years.

c) Grid defection within 5-10 years and a doubling of the kWh rate;

Based on current national trends and predictions by numerous reputable utilities, CSIRO, consultancies and other groups, it is reasonable to assume that within 5 to 10 years 50% of Cooper Pedy's residents will have transferred to off grid power sources if domestic power prices remain at current levels (ie Adelaide Metro Rates).

Under the proposed PPA, reductions in resident demand, and hence electricity revenue, are not proportionately passed on by EC to reduced costs. For example if 50% of Cooper Pedy's residents transferred to off-grid power sources (such as PV, battery and small genset), then the effective electricity rate would increase from 55 c/kWh to 93 c/kWh.

Given the highly likely probability of this risk event occurring, Resonant recommend that DCCP should ensure that DSD specifically recognise, quantify and indemnify DCCP against the cost differential of this risk, and include it in a legally binding document (or the Deed of Grant).

d) Numerous other risks placed on DCCP

The proposed PPA contains numerous aspects and terms which are of concern and which could present significant additional future financial obligations on DCCP.

1. The complexity of the contract itself is a risk, due to the numerous 'do loops', definitions of terms, ambiguities, lack of clarity and brevity, 'subject to certain conditions', uncontrolled document releases (different revisions, but not marked as such), recent adjustments but not specifically highlighted). This is particularly a concern for a small organisation such as DCCP to manage, and it is suggested that

DSD should undertake the management thereof – particularly given that DSD's Crown solicitors have apparently been involved.

2. If EC produce NO ELECTRICITY in any year then DCCP are still obliged to pay the fixed cost of $4.7m p.a. (less Liquidated Damages payable by EG of $90k p.a.) The LDs do not come close to covering this cost burden for no supply, and as before, there are remedies for DCCP, but they are costly, time consuming and could leave residents without power. Although this scenario is highly unlikely, it further demonstrates the unacceptability of the proposed PPA.

3. If DCCP defaulted on their obligations (financial or otherwise) they could be obliged to purchase EC's power generation assets starting at $48.5m and de-escalating to $5m in 20 years. These transfer prices are way above market asset value, and thus serve as a complete block to DCCP ever considering an alternative source of energy.

4. Once the contract is signed, EC have until 24 December 2019 before there are any Liquidated Damages applied to being late on delivery, and even then the LDs are capped at $308,000 p.a. This could lead to DCCP being locked-in to the PPA contract without the benefit of renewable energy for 24 years (as the contract termination expires 20 years after commissioning).

5. The proposed PPA places the obligation of certain capital and maintenance obligations on DCCP. These responsibilities should belong to EC to avoid any risks associated with technical interface issues.

6. The PPA as it stands specifically limits any competitive bid regarding improvements to the electricity rates without it being endorsed by EC, which would reduce the opportunity for rate reductions.

7. DCCP have the intention to be a viable, vibrant town with an iconic renewable project in order to attract increased tourism. Resonant is of the opinion this vision is at serious risk, due to the significant costs and risks mentioned above. In addition, the contract is skewed to incentivise more diesel (thus less renewables), Project delay and no competitive quotes for improvements. As a result, it would deter others to venture into a similar renewable project for no fault of the renewable energy technology.

e) Transparency, Probity and Competitive Tension

Resonant is particularly concerned, that there appears to have been minimal probity, transparency or competitive tension that would be expected of a project of this size and magnitude. As an example, at the request of DCCP, Resonant drafted Expression of Interest (EOI) documents to go out to 8 possible suppliers. However an open EOI was not pursued. Although EC may have competed against other ARENA submissions, and they themselves had a commercial tender to outsource the solar, wind and enabling technologies (DUPS and control), **no tender or competitive process was undertaken by DCCP.** EC did take the initiative and install wind

monitoring and make a submission to ARENA, which would provide some basis for sole sourcing, however Resonant is not aware, prior to being engaged, of any independent detailed review of the PPA commensurate with the magnitude of the Project. EC have not been forthcoming with basic information such as project plans, technical specifications, layouts, organisation charts.

f) The Project appears to be sub-optimal

The proposal that has been presented, whilst technically feasible, is considered sub-optimal for the Coober Pedy community.

1) The Project requires an additional 45% increase in diesel capacity in order to introduce a flywheel for synchronous generation. Flywheels are an acceptable means of ensuring frequency control, however the proposed dual diesel system is considered excessive and not along market trends;
2) A dynamic resistor of 2.5MVA is proposed to spill (burn off through electric heater elements) excess renewable generation. Resonant believes there are numerous other solutions to use the wasted energy more effectively including batteries, hydrogen, compressed air, demand management to significantly reduce the spill;
3) Although a PV array is feasible, distributed solar on residents roofs or covered parking would provide more stable power, reduce losses, reduce capex and allow for more community engagement;
4) The system was devised to suit ARENA's Remote Energy Program subsidy rather than what is best for the client (DCCP). To quote "ARENA will not fund block-shifting", "EC has worked closely with ARENA to determine the scope". Distributed generation with battery storage could significantly reduce the currently 30% renewable energy 'spill' (waste).

There are risks associated with not signing the PPA and going to the market. These include:

- The potential loss of ARENA funding;
- A delay to the project of perhaps 6 months – the time for a tender;
- Straining relations with DSD and ARENA both of whom clearly articulated their full support for the EC proposed Project and PPA to be implemented;
- This may strain relationships;
- The appearance that Coober Pedy 'cannot make up its mind', and the potential for initial 'bad press';
- Aspects of which Resonant are not aware which may influence the decision.

Resonant is fully aware of the numerous bodies cited as having independently reviewed the project including DSD, ARENA, [redacted]. Resonant cannot comment on the terms under which these reviews were undertaken but it is understood that they may not have included a holistic review of the technical, commercial and contractual aspects of the Project including the PPA. Nevertheless, Resonant has considered its opinion carefully in light of the above reviews,

and remains of the firm opinion that the fundamental assertions contained herein are materially accurate.

The body of the report covers the detailed justification for this position. The report considers the PPA from a technical, commercial and contractual standpoint and highlights the numerous weaknesses, risks and poor commercial outcome for Coober Pedy. The body of the report also highlights the possibility of a much higher renewable energy penetration (a much more iconic project), a lower risk pathway, and a superior commercial outcome.

Our key recommendations are that DCCP undertake the following prior to signing the PPA:

1) Carefully consider the proposals from Vendor1, Vendor2 and Vendor3;
2) Persuade the State Government to sign the PPA directly either solely or as cosignatories;
3) Ensure that DSD provide a complete underwriting of the Project and all its associated risks, without which DCCP should 'walk away';
4) Hold a workshop to undertake full risk assessment of the Project in accordance with appropriate AS, ISO, in-house or other standard;
5) Hold a community forum to explain the project and all the ramifications;
6) Obtain an independent commercial assessment of the PPA that addresses many of the questions raised in this report;
7) Assuming DSD provide a suitable underwriting, insist that EC (as a minimum), undertake to provide full transparency with designs, specifications, costing, ARENA funding, project schedules, commissioning criteria prior to signing the PPA;
8) Obtain quotes and initiate installing 100kW of distributed solar PV directly into the 240V feeder under '13.6 Beneficial Change' of the current PPA contract. The payback for such a scheme is estimated as 1 to 2 years – using Simple Payback. This option can be initiated ASAP in order maximise returns, regardless of the decision on the PPA;
9) Discuss with ARENA the opportunity for funding to undertake a 100% Renewable Energy Project with integrated control and demand management with storage options including batteries, hydrogen, compressed air, bio-diesel backup.

1. INTRODUCTION

The District Council of Coober Pedy (DCCP) is responsible for providing electricity to the community. Due to the current high price of providing electricity to the site remoteness and its reliance on diesel generation, the SA Government provides assistance through a Deed of Grant RAES subsidy scheme.

The DCCP has a current Power Purchase Agreement (PPA) with [redacted] to provide electricity to the community by means of 8x500 kW diesel generators. This PPA is due to expire in January 2019.

EC, have sought to propose a new PPA which would allow for the introduction of Hybrid generation in the form of wind, solar PV, diesel backup and DUPS (Diesel Uninterruptable Power Supply), battery storage and also a flywheel/backup power supply. The proposed duration of the contract is 20 years

The SA Government have approved the project and assisted in land approvals in the belief that this is a beneficial project in reducing the quantum of the RAES subsidy.

EC have sought assistance from ARENA, whose objective is to promote new renewable energy projects. EC have been approved to receive $16.5m to $18.5m from ARENA along with EC's equivalent investment.

The Council has since the inception of the idea in 2013 had changes in staff, and the new leadership team have a number of questions about the tender process, the technology, community engagement and the commercial aspects of the contracts now before them.

Resonant Solutions have been engaged to provide a report and recommendations based on the information provided, site visits, meetings with DSD, DCCP and EC.

This report follows on from a draft report presented on 3 December 2015 (document CP-rep-15-03), and also subsequent correspondence, financial/commercial analysis.

[redacted] are the lawyers acting for DCCP.

2. APPROACH

The information below indicates the actions and activities that have led to this report.

Resonant completed and initial assessment in report RS/15/CP/01 in November, which raised concerns of a technical, commercial or contractual nature. Thereafter a site visit was undertaken, to consider siting, the current generating system and grid, community concerns, and demand loads.

A draft report was then issued on 3 December 2015 (RS/15/CP/03), along with a summary of the report (RS/15/CP/04) <removed>

Following the critical meeting on 13th January, Resonant was asked to provide DSD with information highlighting the major risks that required DSD underwriting. <removed>

The following meetings took place and formed part of the investigation to make up this report:

- <removed>

DCCP requested Resonant to draw up an Expression of Interest (EOI) on 26th November, so that a tender process could be undertaken. Unfortunately, an open tender did not eventuate.

Resonant requested two companies to provide budget estimates based on typical information and public information to gauge market information in a discrete enquiry. The results from this were provided on the 2nd February. Vendor1 provided an 'upper bound' estimate which was half the value of the EC bid as shown in Appendix 6. Vendor2 provided a budgetary value even less as shown in Appendix 7.

Appendix 8 shows a financial comparison between the EC proposal and Vendor1, Vendor2, and Vendor3 (who provided a budget price direct to DCCP).

3. DOCUMENTS RECEIVED

The following documents have been reviewed:

i. <removed>

The above is understood to be all the information regarding the project in the possession of DDCP. Specifications, Project Plans, Designs, Feasibility studies were requested, but have not yet been received.

Figure 3.1. Exisiting powerstation with existing 150kW wind turbine along with new wind turbines

4. STAKEHOLDERS

There are a number of key stakeholders involved:

- Communities of Coober Pedy;
- District Council of Coober Pedy – A Public Authority;
- EC;
- <Removed>;
- SA Government – Department of State Development;
- Australian Renewable Energy Agency (ARENA). Independent Agency of the Federal Government;
- <Removed>.

A 'map' showing the relationships between the stakeholders (contract engagements and deliverables) is attached in Appendix 1.

Figure 4.1. 3D rendition of possible solar PV array with exisiting wind turbine and powerstation

5. PROJECT GOVERNANCE

DCCP is a public entity that is required to act in the best interests of the community. It is incumbent upon the Council to not only give due consideration to outcomes but also be perceived to have given due consideration to any outcomes. This is not to say sole sourcing is not acceptable for small specific projects, however given the significant costs that would be committed by Council for the proposed Hybrid Energy Project, it is considered advisable to have total transparency and an open tender process. Such a process would then have a competitive tension that generally results in better commercial outcomes.

There are other a number of companies with experience in the market that could potentially offer superior solutions to EC, particularly as EC have seemingly not undertaken any renewable energy project to date (wind, solar, DUPS).

The DCCP CEO, Tony Renshaw has stated that there appears to have been insufficient community consultation regarding the Project and the siting thereof and there is some disquiet about this from the community. This is of concern, because if there is not community buy-in to the Project, it will not have their support.

EC appear to have negotiated with key stakeholders including ARENA and DSD without full transparency of the negotiations with DCCP. <removed>

The negotiations were done under the EC banner, however it is their subsidiary, that are seeking the PPA and ancillary agreements with DCCP. Furthermore, the PPA has cosignatories of <removed> partners viz. “<removed>”. The exact relationship between <removed> is unclear. This arrangement and the reasons behind this are not sufficiently explained nor in the interest of DCCP.

The added parties introduce complexity, possible confusion and also the potential to limit any redress that DCCP may seek. It is thus essential that these relationships be clarified and reflected appropriately in any PPA that is signed.

In addition, as part of due diligence, Resonant suggests that DCCP and DSD seek the following, if they have not already done so:

- The relationship between EC, <removed>
- The financial position and organisation chart;
- What minimum capital, liquidity or solvency covenants are to be placed on EC;
- Performance or financial support Guarantees from EC’s parent entities;
- Bank performance guarantees;
- What ownership limitations or required DCCP consents (eg for changes of ownership or control of Foreign Sovereign entities) have been placed on EC.

6. COMMERCIAL CONSIDERATIONS

The nature of the capital investment requires a sufficiently long contractual term to be suitable to an investor. The contract term selected is for 20 years, and although there are Transfer Options and Beneficial Charges, it nevertheless appears difficult to opt out or adapt the contract to gain advantage of commercial trends and improvements. As an example, the cost of solar PV is now 1% of its cost of 30 years ago and prices are still dropping. Typical PV systems have halved in the last 4 years. Similarly, battery prices have halved in the last few years and are expected to drop substantially further. At the same time, control technology for Energy Management Systems (that would balance reliable power between diesel, wind, PV and batteries) has improved dramatically and costs have dropped significantly. Finally, there is a trend and indication that grids and homes will have increased penetration of smart meters that are able to control loads in such a way as to minimise peak loads. As an example, *BNEF, New Energy Outlook Global 2015 h*ave noted that utility scale PV is about 10c/kWh for PV and 8c/kWh for wind with both dropping to around 7c/kWh by 2030. This is a global average for utility, so it would be expected that the price would be noticeably higher for small generation at Coober Pedy, but still would be economical.

The pressure from the community to be self-sufficient and the economics thereof are a significant factor affecting the risk of locking in high prices for 20 years. For example, *A Plan for Energy Self Sufficiency* 2015, indicates that Residents could go off-Grid in Tyalgum for around $6-7m and save $0.7m (based on NEM prices) per annum using PV and batteries. This equates to a 10 year payback or 10% IRR (excluding maintenance which is low for solar).

All of the above and numerous other reports point to ever increasing significant economic benefit of renewable energy. The contract does not adequately reflect this.

The proposed contract locks in around $6.7m per annum as shown in Appendix 2. Over a 20 year period, DCCP would be committed to at least a $130m plus escalation, provision of services (including water, easements, roads, site land etc.) and 'event' costs that exceed EC caps. This simplified financial analysis is similar to that done by EC, the only difference being they applied a NPC model. Under the proposed PPA, tariffs will be higher than current for around 5 years, however if a CPI of 3% and real diesel increase of 1.1% is modelled, the PPA would never break even.

The Liquidated Damages for not meeting the Target Renewable Energy Target are capped at $400 000, yet in the extreme, if EC generated no renewable energy, they could still invoice $10.5m for the year, or $3.2m above the target generation (see appendix 2). In this scenario, the SA Government would have to pay the 'gap' through RAES funding.

The proposal has indicated a capital expenditure of up to $37m. Resonant is confident that a significantly lower capital expenditure is possible. The capital amount is not in fact an issue for DCCP or DSD, as the PPA is only about purchasing electricity. Based on capital of $37m, it is assumed ARENA would contribute $18.5m (though the specifics are

unknown). With EC revenue forecast at $7.5m and an estimate for O&M and diesel at $2.2m, EC would get an IRR of 45%. In the current economic climate for a company venturing into a new field (ie no wind, solar, DUPS experience), this is seen as excessive particularly as all major risks are capped.

The Liquidated Damages of EC are limited to $90,000 p.a. for a Feeder and/or Station Outage. This is unacceptably low considering that EC can still charge the fixed rate at $4.7m p.a. Recourse to compensation by DCCP for this is complex, and lengthy.

The contract is structured in such a way, that there are minimal incentives for EC to improve the technology or provide a lower cost of electricity; in fact, the opposite may well be the case.

It is believed to be possible (and likely) to reduce the charge rate more than is currently proposed by means of the right commercial incentives. The average electricity cost is forecast at 54c/kWh and escalated every year by averaged ABS city CPI, however CPI for technology such as this is consistently negative. The implications are that the gap between electricity charges from EC and the Levelised Cost of Electricity (LCOE) would continue to increase.

The potential for defection from the grid in the National Electricity Market (NEM), is considered high risk by the utility operators and could occur within 5-10 years. As a result, utilities are looking at ways that they can incentivise residents to stay on the grid by making the grid a more economically attractive option. A similar pathway is recommended to DCCP, ie ensure that it is more economical and reliable to be grid connected.

At this stage there is also no obvious incentive for the DCCP to sign the contract now, as the community is assured of reliable power until 2019 under the current contract, as long as DSD provide support. Either way, DSD support is required for at least the next 5 years.

However, given the risk of grid defections, force majeure, no easy exit and escalating prices, it is critical that DCCP obtain an absolute guarantee that whatever the circumstances, DSD will pay the 'gap' (difference between EC charges and metro Adelaide).

In consideration of the risk of a lost opportunity, the following is noted:

- There are a number of companies that could provide a Hybrid Generation Project at a significantly lower cost;
- The SA Government could gain a significant benefit if a commercially acceptable PPA were proposed because it would allow the reduction of RAES funding;
- The Federal Government can gain a significant benefit by having diesel displaced due to Fuel Tax Credits – in the order of $25m over 20 years (refer Appendix 2; Figures TBC), compared to 100% diesel. Although from different departments, an ARENA grant for a reconfigured scheme would still save Federal funding.

- DSD is of the opinion that the current proposal will result in savings for DCCP. Resonant is convinced it will cost significantly more if they proceed with the proposal compared to an open tender bid based on the financial analysis referred to in Appendix 2 and also ;
- Renewable energy costs are continually declining, whereas diesel is trending upwards. This means that every delay brings prices down, and so reduces the pressure to sign based on 'there won't be another opportunity'.
- It has been stated that the ARENA subsidy would expire if not used by 22 February, however, based on the above commercial analysis, it is considered highly probable that terms acceptable to both Federal and State Governments could be negotiated, which would retain the support of both entities.

Based on the finances in Appendix 2 and the bids in Appendix 4 and 5, it is apparent that even without any increased subsidy from the SA Government nor ARENA, it would still be more viable to go to open tender.

Of considerable concern is the limitation that EC would place on community installations of PV while still being grid connected. As demonstrated in Appendix 7, it is possible to install solar PV up to 400 kW which would directly displace diesel. The payback is estimated at 1.5 years (or 140% IRR). This is a significant return of investment, but would be difficult to implement because of the Beneficial Clause contained in the PPA, which limits any competition. On this basis, Resonant strongly suggest notifying EC of this benefit with the intention of implementing it.

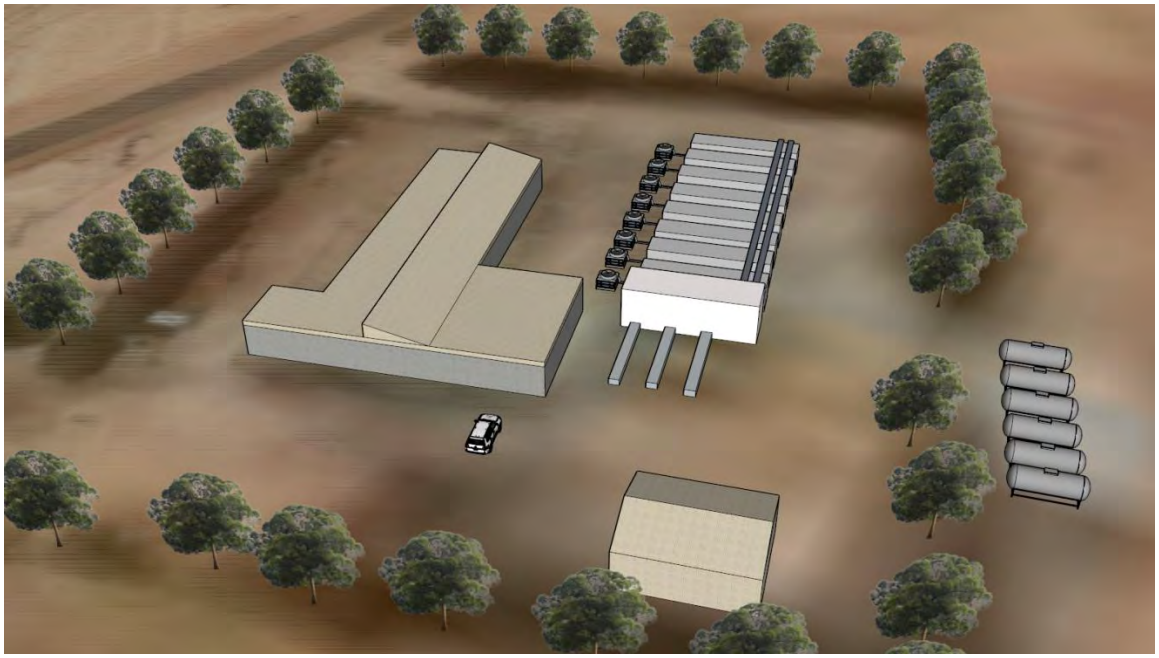


Figure 6.1. Exisiting diesel generators, control building and fuel tanks

7. TECHNOLOGY

DCCP objective is to provide reliable power to the community at an affordable price. The incumbent supplier is using 8 x 500 kW diesel generators with appropriate control and infrastructure.

EC Proposed Hybrid Energy Generation based on docs (x) and (v)

2 x 2 MW wind turbines
1 x 1 MW PV solar panel array
Continuation of the existing 8 x 500kW <removed> Diesel Generators
2 x 0.85 MVA diesel uninterruptible power supply (DUPS)

Figure 7.1. A DUPS unit at King Island

2.5 MW dynamic resistor
0.5 MWh x 2MW battery.
Proprietary monitoring and control System – Enabling Technologies
Infrastructure to connect the above, including feeders, transformers, control building and all other aspects up to the primary side of the 240V transformer

The detailed specifications of the DUPS is unknown and whether the system is an additional 1.7MW generator or purely an inertial load. Average demand is forecast at 1.5MW and peak demand at 3.341MW.

A similar DUPS enabling control system has been utilised at King Island by Hydro Tasmania and appears to be working acceptably, however it has not been deployed elsewhere or at the same power demand as Coober Pedy.

The control system is designed to ensure that power is delivered to the feeders within the bounds of acceptable voltage and frequency tolerances as stated in the PPA.

The proposed system fits into acceptable benchmark practice of 70% renewable penetration with diesel backup and control methodology in principle and is considered by Resonant to be viable.

Although the renewables penetration is targeted at 70%, it only reduces diesel by 66% (current 3.3Ml down to 1.1Ml). This is because a diesel generator would need to run inefficiently at low load in order to be ready for a sudden ramp up of demand or sudden

reduction in renewables (or a combination). This is known as spinning reserve, and is considered necessary to ensure reliable power. There is also the situation where there is excess generation, for example when the wind picks up and/or the solar radiation increases (clouds blow over) or a load is suddenly switched off. In this situation, the diesel generator ramps down, and if required, the dynamic resistor kicks in. The dynamic resistor absorbs the excess generation and dispose of it in the form of heat. The proposed system includes a fly-wheel as a means of supplying smoothing and some degree of storage.

4% of diesel is wasted due to the spinning reserve, but it is unknown what the forecast amount of energy is wasted (known as spill) due to the dynamic resistor. More than 30% of renewable energy is spilled as there is no current proposed means of storing it.

To ensure reliable power and power quality (Voltage and Frequency), it is not unreasonable to expect inefficiencies due to the complex nature of controlling variable generation from wind and solar in addition to potential diesel generator or battery malfunctions.

It has been stated by [redacted] (doc v) that 1500 configurations were considered, however as discussed in a teleconference, no or minimal regard was given to smart grids, distributed solar PV, alternative load to take up spill, capacitor banks, demand management.

In general, from a purely technical perspective, Resonant concur with <removed> that the proposed system is viable. However, Resonant believes that it is a sub optimal system and that the commercial outcomes can be significantly improved. Furthermore, due to a 'Beneficial Clause' in the contract, it is not possible for DCCP to make improvements without EC agreement.

Alternative System Proposals

Although the proposed Hybrid Energy fits within benchmark ranges, the benchmarks are based on average conditions across many varied sites around Australia and are also rapidly outdated. Coober Pedy is situated in a desirable location from a renewable energy perspective due to its high degree of solar radiation and wind resource. This combination is particularly beneficial, as the wind often blows at night. A statistical analysis of wind/solar forecasts would provide an indication as to when backup power is required, but it would be reasonable to consider far greater renewable penetration at Coober Pedy than for a typical site in Australia.

There are an ever growing number of reference sites that are showing a trend towards a non-DUPS type of integration – some using inverter/electronic control some using flywheels, as shown in Appendix 6.

It appears that the proposal did not fully consider smart meters or load shedding. Methods of matching supply with demand, minimising peak loads and balancing voltage and frequency that could be applicable to Coober Pedy include:

- Increased battery bank, which is also (if sized appropriately) able to ramp up power when required or absorb excess generation capacity;
- Alternative storage options such as molten salt (eg. solar thermal), high temperature silicon [redacted], hydrogen, compressed air, flow batteries (redox was trialled at King Island at the time was lacking) or other may not have been considered;
- Switching off high demand loads such as the reverse osmosis plant, water pumping, air-conditioning, ice making equipment, heating or compressed air when there is a shortage of supply;
- Switching on the above when there is a surplus of energy;
- Using Variable Speed generators (though the size may be inefficient);
- Oversupply of wind capacity, with the option to feather if supply is too great;
- Oversupply of solar PV with the option to throttle if supply is too great;

Another alternative that could prove viable to the community, council and DSD is if residents installed PV and smart meters, to assist in managing loads and generation as well as minimising land usage. It would also reduce line losses and voltage drop, though these amounts would be small. It also provides additional back up and distributed generation. The solution also engages with the community, if they so wish, and reduces the risk of grid defection. This arrangement of distributed generation and multiple loads (essentially a microgrid) is considered a probable path for the future as costs continue to decline and reliability is proven. Resonant has provided an Energy Vision previously to DCCP, and this is contained in Appendix 8.

The current trends in innovation and technology in the renewable space is likely to have a significant influence on electricity prices and in turn displace fossil fuels. These factors should be carefully considered with regards the implications of the proposed contract, particularly as clause '20.8 Beneficial Clause' is considered unworkable from a practical perspective in reducing costs for the benefit of the community.

Alternative budgetary proposals have been received by Vendor1 (Appendix 4) and Vendor2 (Appendix 5). Vendor3 have also supplied a proposal to DCCP, however Resonant is was not fully aware of the details at time of release of this report on 8 February 2016.

Resonant recognise that the most challenging aspect of the Project is control and integration of the wind, solar and diesel generation to match the demand of the town which is running at 'megawatt scale'. Rotating machinery (flywheel or spinning reserve) is the most prevalent method of achieving reliable frequency and voltage control, however there is an increasing trend of using more inverter control (at times when there is no diesel generation). Options for consideration are the DUPS as proposed by EC, or a standalone flywheel system or an electronic frequency control system such as inverters connected to each phase.

All options are still in under varying degree of development/commercial reality, but are all feasible. As this is a critical aspect of the Project, more detail has been included in Appendix 9, however this is preliminary discussion only.

8. RISKS

The Governance, Commercial and Technology chapters above highlight the numerous and significant risks that DCCP faces with the proposed PPA. In addition, refer to Appendix 3 and document "Coober Pedy PPA (final draft 20150902)-GD.doc" with mark-ups of the concerns in the contract.

It is imperative that the DCCP undertake a full risk assessment (including probability of various events, the consequence thereof and the risk rating) in accordance with ISO 31000 or AS4360 standards to ascertain the risks of both signing vs not signing.

DCCP should also ensure that they carry no obligations regarding capital or maintenance issues for the generation (to the point of the town grid). This is because they then would be undertaking technical aspects outside their knowledge base, and run the risk of not meeting their obligations. <removed>.

Resonant is of the opinion, that DCCP cannot take on the risk of the PPA as it currently stands without a complete underwriting of the difference between revenue raised from the town and the costs associated with the PPA for 20 years (not subject to any review or approval). There should also be an agreement, that this undertaking would not affect other town services that State Government currently support. Without such a watertight agreement, DCCP would be extremely exposed.

The reason that Resonant propose such strong guarantees from DSD is because:

- The commercial burden imposed by EC is significant and in our opinion not reasonable. DSD proposed in a letter to only commit to the 'reasonable' difference in Gazetted prices and EC charges;
- EC have capped all their risks. DCCP would carry the financial burden above the capped risk;
- It is predicted (by many agencies including CSIRO, Utilities, Consultants), that there will be a steady increase in grid defection. The cost of transferring to off grid power sources has consistently decreased year on year for the past 15 years and by all accounts this trend is expected to continue for at least the foreseeable future. This will increase the proportional costs for those remaining on the grid. To circumvent the 'death spiral', utilities would encourage users to remain on the grid by allowing PV installation by users. The EC proposal does not allow for this. As such, it is highly probable that within 10 years, 40-80% of residents could defect the grid, leaving only the poorer members of the community left on the grid – those who cannot afford the capital, or who are currently being supported. Under this highly realistic rate, the average kWh charge would increase by 70%;
- A 20 year locked in PPA is unrealistic in this rapidly changing market. As a result, the CEO of AGL stated that typically 15 years was the maximum term for a PPA;

- The PPA does not allow for any competitive solution to be implemented for 20 years. There is a limit of 100kW on distributed PV, which is generally acknowledged as one of the most economic solutions to power;
- Resonant consider the Beneficial Clause to be unworkable in practice;
- ARENA typically grant funds to pre-commercial activities. By this very nature, there is technical risk, however EC have no wind, solar nor DUPS experience and would rely solely on their subcontractors. Without this experience, Resonant would expect significant issues with project integration/overlap;
- EC referred to the Project as 'ready' and 'shovel ready', which could be construed as misleading. On later clarification it was apparent that there is significant design, specification, procurement work to undertake, and that at earliest construction is 7 months away;
- EC have not provided a Project Plan showing dates and activities.

There are risks with not signing the PPA and going to the market. These include:

- The potential loss of ARENA funding;
- A delay to the project of perhaps 6 months;
- Straining relations with DSD and ARENA both of whom clearly articulated their full support for the EC proposed Project and PPA to be implemented;
- EC are the incumbent diesel supplier, and this may strain relationships;
- The appearance the Coober Pedy 'cannot make up its mind', and the potential for initial 'bad press';
- Aspects of which Resonant are not aware which may impact on the decision.

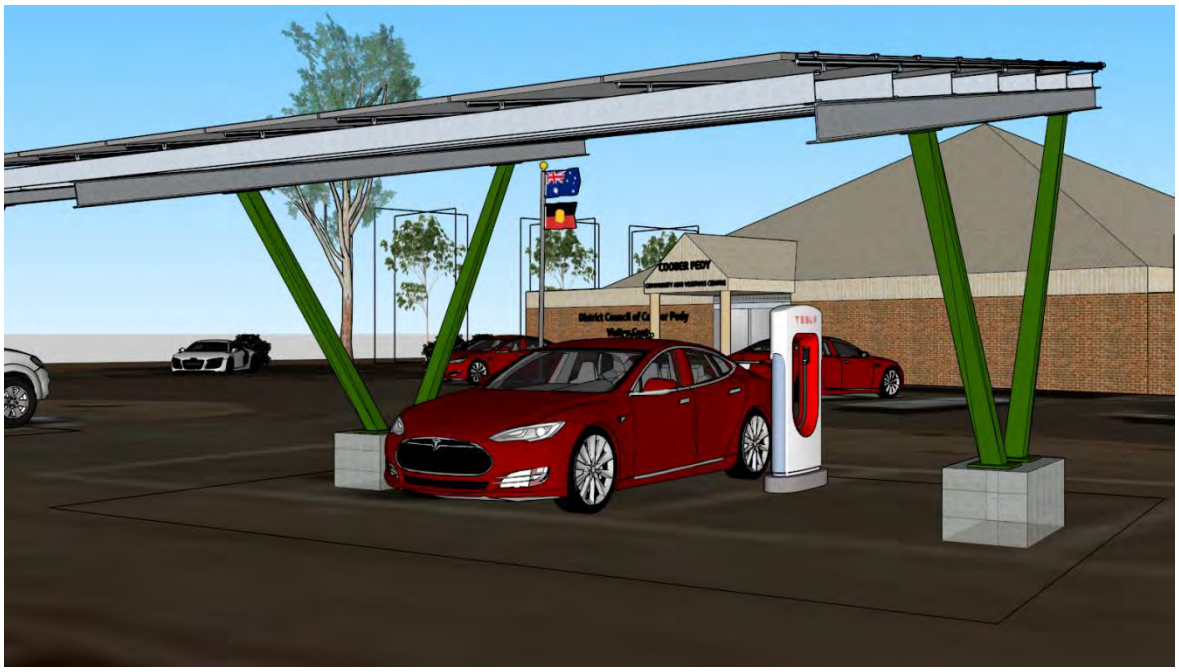


Figure 8.1. PV panel shaded parking with electric or hydrogen vehicle charging station

9. CONCLUSIONS AND RECOMMENDATIONS

In summary, Resonant Solutions advise that DCCP carry significant risk by signing the documents. If DCCP were to pursue the PPA, it is essential that the following undertaken:

1) Ensure a full risk assessment has been undertaken in accordance with appropriate AS, ISO, in-house or other standard;
2) A community forum be held to explain the project and all the ramifications;
3) Ensure that all capital and operating works are installed by EC such that there is no responsibility or obligation by DCCP on any technical maters;
4) Obtain the following information <removed>
    a. A project plan (timeline) showing activities and when they will happen; (as it stands construction is at least 7 months away);
    b. Clarify commissioning and completion date, what tests will be undertaken to meet what criteria;
    c. A full detailed list of proposed equipment with specifications;
    d. Single Line Diagram showing the proposed Project layout;
    e. 10 minute data on the output of the current 150 kW wind turbine; (It would be ideal to get their data on the 10 minute wind speed intervals, but they understandably may not want to provide this)
    f. Confirmation that they will undertake the entire capital and maintenance works, so that DCCP do not have any technical obligations;
    g. Commitment to providing full project, design, specification, weather and SCADA data for the project as it becomes available;
    h. Confirmation of complete transparency with the project information – such as subcontractors, site visits, deliverables, detailed plans, equipment etc.
    i. Clarify that either full AS, ISO and IEC standards are applicable;
5) Engage again with the State Government to sign the PPA instead of DCCP or at least be cosignatories;
6) Obtain a Deed of Grant (or other legal instrument) from the SA Government DSD department that clearly indicates that they will pay the gap between Gazetted Electricity Prices (Adelaide Metro) and all costs associated with the PPA contract up to the full theoretical liability of $208 Million Dollars from EC plus the capital and maintenance costs that DCCP would incur for the HV generation works. This Deed must not be subject to review/approval <removed>;
7) Consider the proposals tabled by the Vendors and the significant saving per annum of over $3-5m;
8) Obtain quotes and initiate installing 100kW of distributed solar PV directly into the 240V feeder under ‘13.6 Beneficial Change’ of the current PPA contract. The payback for such a scheme is estimated as 1 to 2 years – using Simple Payback. Not only would this likely pay for itself before EC would commission the Project, but would also test the beneficial clause for workability.

Previously suggested recommendations are shown below, however given the fact that the proposed PPA offer expires on 22 February these items may not be a priority.

9) Apply to ARENA for funding to undertake a feasibility study into a 100% Renewable Energy Project (REP) with integrated control and demand management
10) Engage with ARENA to determine the 'best' means of obtaining funding for a new proposal, in the event the EC PPA falls over.
11) Initiate an Expression of Interest (EOI) to gauge indicative prices and technology available on the open market for a PPA and/or EPC (Engineer, Procure, Construct)
12) Obtain the weather data (wind and sun at 10 min intervals) either form met mast, Nordex turbine output or PV SCADA on RO plant.
13) Develop a full specification and initiate a Request for Tender (RFT) for either a PPA or a Build Own Operate Maintain (BOOM), or an Engineering Procurement Construct (EPC) contract.

Figure 9.1. Coober Pedy Council with shaded PV parking and electric car charging station

Figure 9.2. Areial view of the proposed system for Coober Pedy

APPENDIX 1. MAP OF STAKEHOLDER RELATIONSHIPS

<removed>

APPENDIX 2. COMMERCIAL ANALYSIS

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968 www.reson.com.au

Energy, Project Management, Engineering

Doc: CP-xls-16-02 Author: G Davies Date: 8 Feb 2016

Cost Comparison between vendors. This report is identical to 8 Feb 106 report, with vendor information removed.

Vendor Comparisons

		EC	Vendor1	Vendor2	Vendor3	
1	Total Capital	36	26	20	18	Million AUD
2	Ave sell rate	61	36	25	20	c/kWh
3	**Total PPA cost p.a.**	**7.5**	**4.4**	**3.1**	**2.4**	M$/a
4	**SAVINGS PA**	-	**3.1**	**4.4**	**5.1**	M$/a
5	**TOTAL SAVINGS - 20yrs**	-	**62.0**	**88.9**	**101.1**	M$ Note 1
6	**Maximum Liability**	**208**	TBD	TBD	TBD	M$ Note 2
7	Wind experience	No	Yes	Yes	No	
8	Solar PV experience	No	Yes	Yes	Yes	
9	Battery experience	Yes	Yes	Yes	Yes	
10	Renewable integration experience	No	Yes	Yes	No	Note 3
11	Developer experience	Yes	Some	Some	Some	
12	Diesel experience	Yes	Some	Some	No	
13	SA Office	No	Yes	No	Yes	
14	Use of surplus energy	No	Yes	No	Some	Note 4
15	Upgradeable	Difficult	Yes	Yes	Yes	
16	Diesel capacity increase	44%	0	0	0	Note 5

NOTES

1 Using present day value for simplification and comparison. A DCF/NPV to be done later
2 This is the maximum exposed theoretical limit based on the PPA contract. 100% diesel less LDs
3 This refers to either an inverter, flywheel of DUPS (Diesel Uninterupted Power Supply)
4 [redacted]
5 EC propose a DUPS system which requires diesel engines. The other vendors intend phasing out diesel
6 For comparison purposes, the costs shown are those that will be charged directly by the supplier.
7 Diesel Rebates and LGCs are recoverable by DCCP but should be the same regardless of supplier
8 Charges (prices) neglect subsidies from ARENA and DSD for comparison purposes.
9 [redacted]
10 The proposal are subject to finalisation, possible upfront data collection, certain civils and contingency.

Resonant's Estimate of total project savings is $85M over the project life

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968 www.reson.com.au

Energy, Project Governance, Engineering

Doc: CP-xls-16-02 Author: G Davies Date: 8 Feb 2016

Summary of costs for Hybrid Project vs Current

1) Total charges per annum

	Scenario 1: Target Renewables	Scenario 2: 100% Renewables	Scenario 3: 100% Diesel	Current Contract	
Total Payable to EC	**7,494,381**	**5,743,043**	**10,776,652**	**6,500,936**	(excludes rebates recoverable by DCCP)
Ave cost /kWh	**0.55**	**0.49**	**0.77**	**0.43**	(includes rebates and subsidies)

2) EC Liquidated Damages OUTAGES (Schedule 10)

Station Outage above 160mins p.a.	= $1500 + $30 x Outage Period (mins)		Schedule 10 of PPA
Max LD per Outage per day	= $6000 (eqivalent to 150mins or nearly 3 hours)		
Feeder Outage	= NF/TF ($1500 + $30 x Outage Period mins)		
Max LD per Outage per day	= $6000 (eqivalent to 150mins or nearly 3 hours)		
	where NF/TF is the proportion of that feeder over total feeder		
MAXIMUM AGGREGATE LDs p.a.	= $90 000		
If no electricity is produced in a year, EC earn	$ 4,674,900	(Fixed annual charge of $4.764k less LDs of $90k)	

3) EC Liquidated Damages Renewable Target (Clause 21.3)

LD for shortfall per kWh (x 0.98)	49.5c/kWh	Below Target as per Schedule 13 and CPRHP xls. COMPLEX
MAXIMUM LD	$400 000	(reached at about 800,000 kWh or 7% of total annual elect)
If no renewable generation in a year, EC earn	$ 10,376,652	(100% diesel less LDs of $400k)

4) EC Liquidated Damages for Construction (Clause 9.5)

LDs are only applicable after 24 December 2019 and capped at $308 000

5) Transfer Charges (Clause 34.2 and 26.1, 27.2, 31.3 32 or 44.2 and schedule 11)

	Seller Default	Buyer Default	Unit	Year
The value of transfer for any default	29.3	49.6	Million $	yr 1
	16.5	28.3	Million $	Yr 10
	3.6	4.7	Million $	Yr 20

If DCCP default on payment, they would be obliged to purchase the assets at 3x EC Capex

6)Project Capex not yet fixed, but approximately

	AUD Million
EC contribution	18.5
ARENA contribution	18.5
	37
Market Estimate	**18-26**

7)DCCP Capital and Operating Expenditurefor new Hybrid Project refer Schedule 5 of Contract

Roads, water, services	TBD	AUD	
Managing the contract	TBD	AUD	
Inspections and disputes	TBD	AUD	
6.6KV Circuit Breakers	TBD	AUD	
6.6KV Feeder	TBD	AUD	From Switchgear to Transformers
6.6kV:240V Transformers	TBD	AUD	

8)Grid Defection

Based on the ever decreasing costs of PV/batteries, it is estimate that 50% of the town would defect from the grid within 10 years if prices remainded at Adelaide Metro rates.

	2016	2026	(50% defection and 90% renewables)	
KWh annual demand				
Revenue	4.3	2.1	M$	From residents and subsidies
Charge	6.7	5.7	M$	Cost less subsidies
Additional shortfall	2.4	3.6	M$	
kWh average	0.55	0.93	c/kWh	
Increase in kWh rate		70%		

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968 www.reson.com.au

Energy, Project Governance, Engineering

Doc: CP-xls-16-02 Author: G Davies Date: 8 Feb 2016

Costs estimates of electricity, based on the proposed contract between Energy Generation Pty Ltd and DCCP. The calculations are in general agreement with EC modelling.

Electricity Costs for Hybrid (Based on clause 20 of proposed PPA and first order analysis.)

	2015 costs (escalted since 2014 as per DSD)			
a	59152	p.m.	(a)	the Fixed Charge;
b	0.072	$/kWh	(b)	the Billing Period Variable Operating Charge;
c	0.4251	$/kWh	(c)	the Billing Period Variable Diesel Fuel Charge;
d	0.25506	$/kWh	(d)	the Billing Period Wind Turbine Charge;
e	163518	p.m.	(e)	the Billing Period Solar Fixed Charge; and
f	174405	p.m.	(f)	the Billing Period New Wind Fixed Charge

ASSUMPTIONS

Rough estimates assuming inflation, CPI and discount rates effectively cancel each other out.

Diesel rebate and LGCs are for DCCP account - though these are at risk. No Carbon price included

Average electricity demand	1400	kW	Quoted in EC/ARENA due diligence
Calculated forecast energy p.a.	12,264	MWh p.a.	calculated from above at 8760 hrs p.a.
Recorded Energy - 2014	**12,225**	MWh p.a.	From DSD figures
Wind Turbine generation	**384**	MWh p.a.	EC NPC financial data
Additional Renewable energy	8,672	MWh p.a.	Quoted in ARENA due diligence

Total charges based on an annual basis

Fixed charge p.a.	709,824	$ AUD	12 months x rate (a)
Solar Fixed charge p.a.	1,962,216	$ AUD	12 months x rate (e)
Wind Fixed charge p.a	2,092,860	$ AUD	12 months x rate (f)
Total forecast Fixed Charge	4,764,900	$ AUD	

	Scen 1	Scen 2	Scen 3	Current Contract	Different Scenarios
Proportion Wind	3.0%	3%	0%	0%	% of electricity by 150kW WTG
Proportion New Wind	48.8%	50%	0%	0%	% of electricity by new wind
Proportion Solar PV	14.5%	47%	0%	0%	% of electricity by PV
Proportion Diesel	33.7%	0%	100%	100%	% of diesel elect (ARENA report)
				799,698	fixed (Base of $65,415 p.m.)
Variable charge p.a.	880,200	880,200	880,200	569,685	12160 MWh x 1000 x rate (b)
Wind Charge	97,943	97,943	97,943	97,943	394 MWh x 1000 x rate (d)
New Wind Charge	-	-	-	-	kWh x percentage x (d)
Solar Charge	-	-	-	-	zero charge regardless of kWh
Diesel Charge	1,751,338	-	5,033,609	5,033,609	kWh x percentage x (c)
Total Variable Charge	2,729,481	978,143	6,011,752	5,701,237	
Total Forecast p.a.	**7,494,381**	**5,743,043**	**10,776,652**	**6,500,936**	Payable to EC
	0.61	**0.47**	**0.88**	**0.53**	Effective rate in c/kWh
Fuel Credit Rebate	432,962	-	1,283,152	1,283,152	.38c/l. 3376716 litres p.a. for diesel only
LGC (est $43/MWh)	372,896	525,675	-	-	Ave Acil Tasman for next 5 years
		819,186			Renewables Bonus to EC
Total Cost to DCCP	**6,688,523**	**6,036,554**	**9,493,500**	**5,217,783**	
Ave cost /kWh	0.5471	0.4922	0.7741	0.4255	

NB. 1	The LGC spot rate is currently above $70/MWh, however forecasting is beyond the current scope
NB. 2	Diesel rebates could be withdrawn over time
NB. 3	Scenario 1 is closest to targeted amount
NB. 4	Scenario 2 is an ideal at 100% renewables
NB. 5	Scenario 3 shows all diesel -worst case
NB. 6	For simplification, A 20 year NPV, IRR, DCF incorporating O&M, risk and discountinghas not been undertaken yet

APPENDIX 3. PPA CONTRACT MARKUPS

Markup of PPA contract “Coober Pedy PPA (final draft 20150902)-GD.doc”.

APPENDIX 4. VENDOR1 PROPOSAL

Vendor1 proposal document “xxxxxxxxx.pdf”.

APPENDIX 5. VENDOR2 PROPOSAL

Vendor2 proposal document “xxxxxxxxx”.

APPENDIX 6. REFERENCE SITES

Project name	Location	Project Stage	Companies	Wind MW	Solar MW	Diesel MW	Storage MW/MWh	Other RE MW	Off-grid?	Web	Comments	Other resources
Feldheim	Feldheim, DE	operating	Energiequelle	74	0.12	-	10 MW battery	0.4 biomass,EV	Microgrid commu	http://ecowatc	Near Berlin, DEPop	Good reports, mu
IREN2	Wildpoldsried, DE	operating	SiemensAÜWIDI	11 turbines	200 PV systen	-	0.138MWh0.3MWbattery	4 bio digesterssn	no, RE export to	http://www.ire	Population 2500RE	Very high level ov
Marble Bar	Marble Bar, WA, AUS	operating2010	Horizon Power, A	-	0.3	4 x 320kW	0.5MWflywheel	-	yes, ABB Microg	http://onestep	Population 600El. T	Many related pub
Nullagine	Nullagine, WA, AUS	operating2010	Horizon Power, A	-	0.2	3 x 320kW	0.5MWflywheel	-	yes, ABB Microg	http://onestep	Population 600El. T	detailed King Isla
Bonaire	Bonaire Island, NL	operating2011	EvelopEnecoEco	11MW12 Ene	-	14 biodiesel (5x	3MWSaft 3 MW SMRX n	-	yes	http://www.rm	Population 14,500s	Our modeling car
Kodiak	Kodiak, AL, US	operating2014	Kodiak Electric A	9 (GE 1.5MW	-	33	3 MW 2 MWh gel lead-ac	30MW hydro	yes	http://www.rm	Population 13,000El. tariff: 15ct$99.7	
El Hierro	El Hierro, Canary Islan	operating	EndesaCanary In	11.5	-	12.7	11.3MW hydro700m head	-	yes	http://www.rm	Population 11,000El. tariff: 17ct$100%	
Falkland Islands	Falkland Islands, UK	operating20072010	Falkland Islands	1.98 Sandy B	-	6.6	small flywheel	-	yes	http://www.rm	Population 2,500El. tariff: 30ct$33% r	
King Island	King Island, TAS, AUS	operating	Hydro Tasmania	King Island Renewable Energy Integration Proj			2MW flywheel (2x 1MW)1.5MWh battery		yes	http://www.rm	Population 1,800El. tariff: 19ct$65% r	
Coral Bay	Coral Bay, WA, AUS	operating2007	VerveABB	3 x 200kW	-	7 x 320kW	-	-	yes, ABB Microg	http://www.rm	Population 140El. tariff: 22ct$45% ren	
Isle of Eigg	Isle of Eigg, Scotland,	operating2008	Eigg Electric Ltd.	0.024	0.05	0.064	0.72 battery	129kW hydro	yes	http://euanme	Population 100El. tariff: 31ct$87% ren	
Necker Island	Necker Island, British V	in construction2016	NRGVirgin	0.9	0.3	0.96	0.5MWh battery	-	yes	http://www.rm	Population 60El. tariff: 24ct$80% rene	
Mawson Station	Mawson Station, Antar	operating2003	Australian Antarc	0.6 (2x Enerc	-	0.55	-	-	yes	http://www.rm	Population 3050% renewable	
Tyalgym	Tyalgym, NSW, AUS	planning	Energy for the Pe	-	2.7	-	2.7 battery	-	not yet	http://sustainnorthernrivers.org/wp-content/uploads/		
Alcatraz	San Francisco, Calif	operating	Sacramento Mun	-	0.307	yes	2 lead acid battery	-	yes	http://www.go100percent.org/cms/index.php?id=778		
Degrassa	DeGrussa Copper-Gold	construction2016	SandfireJuwiABB	-	10.6	yes	2x2MW battery	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Hopetoun	Hopetoun, WA, AUS	operating2007	VerveABB	2 x 600kW	-	7 x 320kW	0.5MWflywheel	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Ross Island	Ross Island, Antarctica	operating2009	New Zealand's Ar	3 x 330kW	-	9 x 125kW	0.5MWflywheel	-	yes	https://library.	dual 50Hz, 60Hz	
Rottnest	Rottnest Island, WA, A	operating2004	VerveABB	1 x 600kW	-	3 x 325kw	-	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Esperence	Esperence, WA, AUS	operating2003	VerveABB	6 turbines plu	-	yes	-	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Denham	Denham, WA, AUS	operating2003	Western PowerA	3 turbines	-	yes	-	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Faial	Faial, The Azores, Por	operating2013	Electricidade dos	yes	-	yes	-	-	yes, ABB Microg	https://library.	3.5Ml fuel saved per year	
Flores	Flores Island, The Azo	operating2005	Electricidade dos	yes	-	yes	0.5MWflywheel	-	yes, ABB Microg	https://library.	100% renewable	
Cocos Island	Cocos (Keeping) Island	operating2004	Cocos Dpt. Trans	4 x 20kW	-	4 x 320kW	-	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Bremer Bay	Bremer Bay, WA	operating2005	VerveABB	1 x 600kW	-	1.3MW distribut	-	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
Laing O'Rourke c	remote QLD, AUS	operating2015	Laing O'RourkeA	-	0.141	4 x 450kW	-	-	yes, ABB Microg	https://library.	ARENA fundedPortable system	
Gorona del Viento	Gorona del Viento, Car	operating2014	ElecnorEndesaA	5 x 2.3 MW	-	11 MWemergen	11.3MW hydro	-	yes	https://library.	100% renewable	
Rawson	Rawson, Robertson La	operating2003	Australian Antarc	2 x 300kW	-	4x 125kW	-	-	yes, ABB Microg	https://library.	excess wind energy goes into electric	
Longmeadow	Longmeadow, ZA	construction2016	Longmeadow Bus	-	0.75	yes	1 MVA/380 kWhbattery	-	yes, ABB Microg	https://library.e.abb.com/public/e4e8b072b07643be		
TKLN	Ti Tree, Kalkarindgi and	operation	EpuronPWC	-	1	yes	-	-	yes	http://www.epuron.com.au/project/tkln/		
Tuvalu	Tuvalu Island	stge-wise impleme	Tuvalu Electrici	to be conside	approx. 0.8	2MW (3x 750kV	tbd	-	yes	http://www-wc	3 islandspopulation approx. 10,00010	
Tonga	Tonga Islands - Tongat	Modernisation of e	Tonga Power Lim	-	2.4 MW existir	16.5	-	-	yes	http://www.tor	Population: 110,000	
Fiji Renewable E	Fiji Islands	operatingand furthe	UNDPIRENAFiji I	10	-	114 incl heavy c	-	120MW hydro	Island grid	http://www.rm	Population: 881,000Renewables: 60%	
Northern Cook	Northern Cook Islands,	operating2014100%	CAT ProjectsNZM	-	0.189	yes	-	-	yes	http://www.rm	Population: 1,441Renewables: 95%E	
Tokelau	Tokelau, NZ	operating2011	IRENANew Zeala	-	1	coconut biofuel	battery	-	yes	http://www.rm	Population: 1,400Renewables: 100%	
Monte Trigo	Monte Trigo, Cape Ver	operating2011	Trama TecnoAmb	-	0.027	yes	battery	-	yes	http://www.rm	Population: 600Renewables: 95%	
Ultsira	Ultsira, Norway	operating2003	Sweco NorwayNo	0.6	-	yes	hydrogenflywheel 5kWhb	-	seacable connec	http://www.rm	Population: 212Renewables: 100%	
'Zero fossil fuels	Floreana, Galapagos, E	operating2005	GIZ	-	yes?	2x 69kW jatroph	-	-	yes	http://www.rm	Population: 200Renewables: 100%El	
Over Yonder Cay	Over Yonder Cay, Baha	operating2009	Northern Power	0.3 (3x North	0.375 (Evergre	0.4	6 battery lead acid	-	yes	http://www.rm	Population: 0Renewables: 96%	

APPENDIX 7. DISTRIBUTED COMMUNITY PV

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968 www.reson.com.au

Estimate 100kW PV System - Coober Pedy

Doc: CP-xls-16-02b Author: G Davies Date: 26 Jan 2016

Preliminary costs estimates of installing 25 x 4 kW PV systems.

Number of Systems	25	Separate installations
Size of Projects	4	kW
Battery Storage included?	FALSE	7kWh LiFePO4, 80% DoD, 3kW discharge
Hybrid Inverter included?	FALSE	Hybrid inverter needed for DC coupled systems only
Distance to Metro region	1400	km
STCs per kW	24	higher than in Adelaide
Price STC	38	$

	$/W - $/Wh	**$/System**	**$ portfolio**	
Solar panels	0.75	3000	75000	Tier 1. Top Quality
Inverters - normal	0.25	1000	25000	eg. Zeversolar
Inverters - hybrid surcharge	0	0	0	
Racking	0.15	600	15000	Pitched Roof
Batteries	0	0	0	
Balance of System (BOS)	0.2	800	20000	
Freight	0.05	200	5000	TBC
Installation Labour	0.33	1320	33000	3 people per day
Backoffice & overhead	0.15	600	15000	
Travel for portfolio	0.168	672	16800	
Accomodation per project	0.075	300	7500	
Profit	0.3	1200	30000	Competitive Market
GST Applicable	0.2423	969.2	24230	
STC Deduction	-0.912	-3648	-91200	
Total ex GST	**1.511**	**6044**	**151100**	
Total incl. GST	1.753	7013	175330	

Current $/kW	53.00	c/kWh	Based on PPA. TBC
Electricity per 1kW panel p.d.	5.0	kWh	CEC for Coober Pedy
Electricty saved p.a.	182500	kWh	100kWx365 Based on no spill
Financial Savings p.a.	96725	$	
Simple Payback	1.56	years	
IRR - 10 years CPI=0	146%		Conservative. Panel degradation 1% O&M 10%, new inverter after 5yrs

APPENDIX 8. COOPER PEDY PROPOSED ENERGY VISION

Coober Pedy has the potential to be powered by 100% renewable energy and be an example of a sustainable society in a future circular economy. It could significantly enhance its tourism by being an oasis in the desert and a futuristic innovative hub to complement its current opal, outback and transport stop over reputation.

Wind energy followed by solar PV are considered the lowest cost energy sources and Coober Pedy has excellent resources of both. By combining these with some form of storage/backup power, the town has the capability to be powered by 100% renewable energy.

In order to provide 100% energy, renewables need to be sized for times of lowest energy generation and highest demand. This requires backup or storage capability, however even with this, there is on many occasions still surplus power. The methods of storage could be batteries, but there are also other possibilities including compressed air, solar thermal generation with molten salt and hydrogen.

Because of the low relative price of wind and solar, it is possible to oversize them noticeably and minimise the storage and control. This leads to much abundant 'free' energy, which could be wasted (feather the turbines, throttle the solar or use resistor banks), however it could also be used usefully. The 'best' way to use this energy would depend on each society.

Coober Pedy is blessed with extensive water resource from the GAB. The combination allows for endless opportunities which given the entrepreneurial spirit of the town could easily be exploited. These include: fruit and vegetables production (in green houses or outside) as well as certain types of animals. Fine mist (evaporative cooling could be used as required) for all fauna/flora and also for humans who wish to experience a desert in summer inside the comfort of an oasis. When the wind blows on a hot day, there would be abundant surplus energy, so installing a large ice making machine would be possible – or even snow*. Brine from the RO plant could be used for olive pickling.

The surplus energy could also be used to produce hydrogen, which through the use of fuel cells provides backup power and is also a saleable product and potential fuel of the future. The solar PV panels could be distributed around town, setup on derelict land and also at the main centre. The distribution of the PV makes the system more reliable from both a line failure but also localised cloud cover.

The ability to have switchable loads (demand management) in a system makes it much easier to control and provide reliable quality power to the town. Compressed air, hydrogen, batteries are all good absorbers of excess power, but also providers of power when needed. Electric Vehicle charging station could also help ensure less reliance on diesel and ensure energy security. It could also be a hub and centre of note to complement the Solar Challenge.

*This may not be considered sustainable, but could be economic!

APPENDIX 9. CONTROL SYSTEM ANALYSIS

Control Introduction

A hybrid energy system is a term used to describe multiple sources of energy generation at a single site including wind, solar and diesel. The term micro-grid (or mini grid) is also used in the report to describe multiple generation sources connected by an electric grid, with multiple loads attached. A load is any electrical device connected to the grid and includes a home, washing machine, fridge, air-conditioner or pumps.

The difficulty with a hybrid system is the complexity of the monitoring and control of all the generators, loads and storage devices. The demand (total load on the grid), has to balance the supply. Thus if loads are suddenly increased, generation should increase accordingly at the rate at which the load was ramped up.

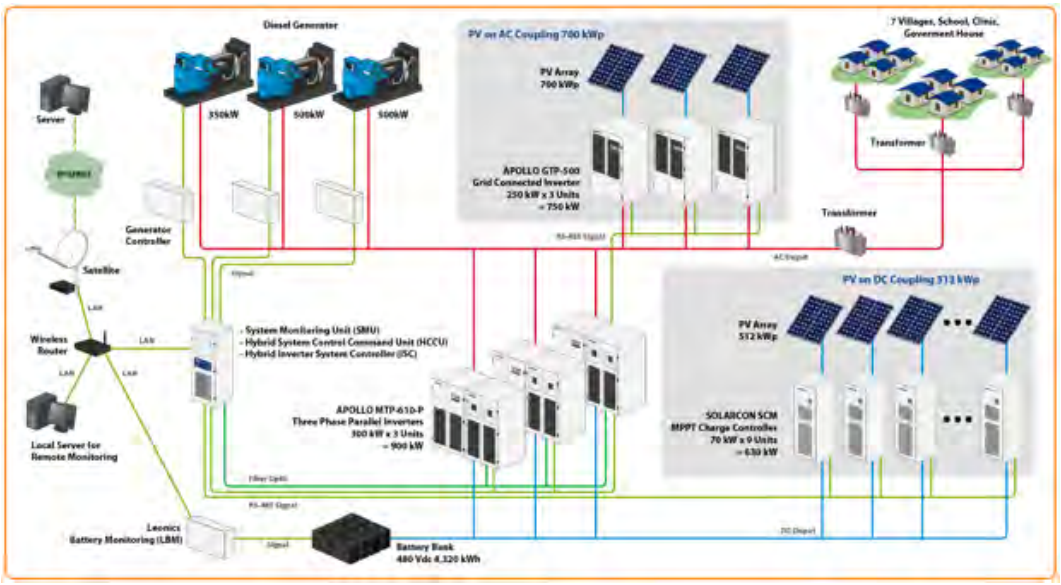
Similarly if a generator is suddenly curtailed (eg a diesel engine trips, the wind reduces or a cloud moves over the sola PV panels, generation must ramp up accordingly. This can be done my means of drawing from a charged battery bank, allowing the rotating inertia of a flywheel to be a generator, or switching on another diesel engine.

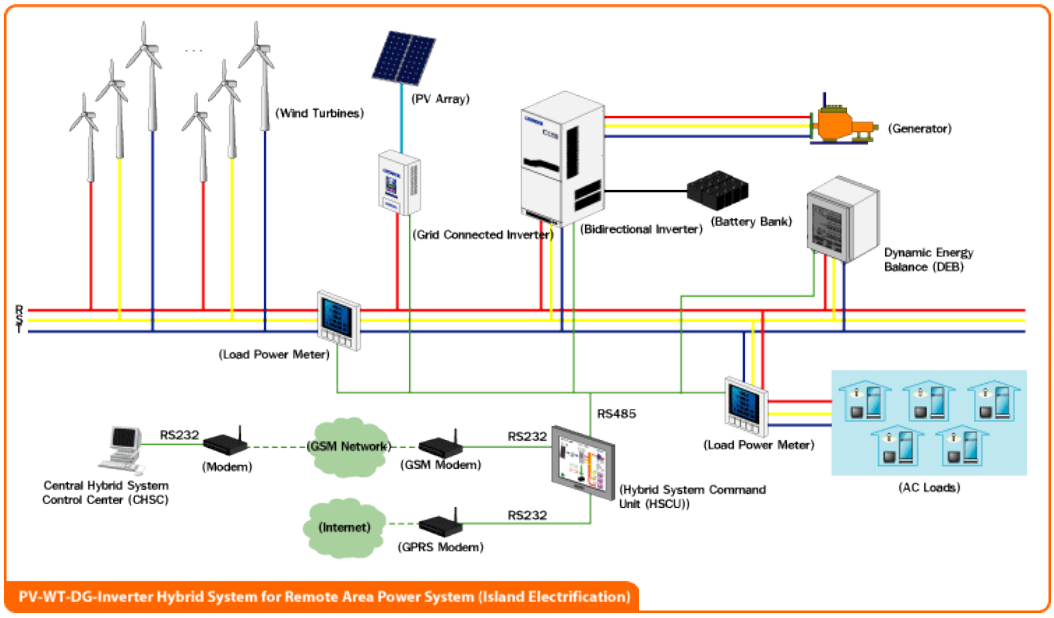
The speed with which the diesel can ramp up is not as rapid as for example the speed at which a battery or flywheel can deliver power.

If the grid is in balance, and a load or multiple loads are suddenly switched off, the electricity delivery to the town must be curtailed accordingly. This could either be done by ‘spilling’ (wasting) the excess generation capacity in a dynamic resistor (acting like a giant toaster), or by using the energy to speed up the flywheel or charge a battery. There is of course the opportunity to switch off a diesel generator, but then there may not be enough generation capacity, or the opportunity to start up another load such as a bore pump – which only needs to run every so often.

This is where the control system comes in. It needs to manage the generation and loads at the millisecond interval level, understand what is happening and take action by switching equipment on or off.

The two diagrams below show typical examples of Diesel, Wind & Solar systems





The design of hybrid systems consisting of varying wind and photovoltaic (PV) capacities, together with storage and diesel capacities needs to be considered along with the anticipated load profile or demand management. The calculation of the optimum system based on various assumptions is complicated and can be resolved by oversizing units or optimising using available software products available on the market. When designing a hybrid system account needs to be taken of the frequency dynamics, voltage, power system stability and its operation. Frequency dynamics are faster in power systems with low rotational inertia, making frequency control and power system operation more challenging. Rotational inertia is considered the preferred standard for controlling frequency and voltage, however there is an increasing trend to lower inertias along with storage and inverters. The report “Impact of Low Rotational Inertia on Power System Stability and Operation” asserts that a high proportion of inverter-connected power generation can have a significant impact on power system stability and power system operation. Key findings are:

<removed>

PLC & SCADA Control

The control and monitoring of the PV and Wind equipment would likely be achieved using a dual redundant PLC & server network. The existing PLC controlling the eight diesel engines will require a programming and operation investigation before an integration strategy can be implemented. A determination of the current SCADA/PLC equipment and its associated networks will be required with a view to evaluating the suitability of the system for modification or if the system requires a complete upgrade to bring it in line with the new system network and its SCADA control convention.

<removed>

Design and function

<removed>

Design
<removed>.

I/O and communication
<removed>

Engineering
<removed>.

Diagnostics / Module replacement
<removed>

Dual Redundant SCADA Server System

<removed>.

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968

Tonsley Innovation Hub
1284 South Road
Clovelly Park
5042

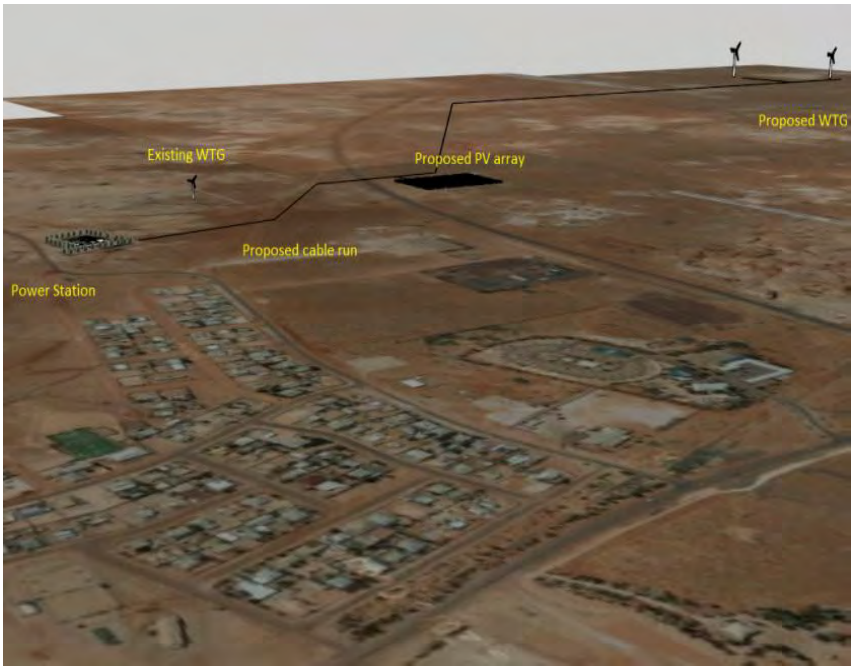
Tel. 08 8125 5637

info@reson.com.au
www.reson.com.au

Energy, Projects, Governance, Engineering

Costing Overview of the Coober Pedy Renewable Hybrid Project

(For Limited Public Release)



Client	**:**	**District Council of Coober Pedy**
Author	**:**	**Graham Davies**
Date	**:**	**07 February 2017**
Document	**:**	**RS-rep-17-02**

OVERVIEW OF THE PROJECT COSTING

Resonant Solutions is engaged by the District Council of Coober Pedy (DCCP) to report and provide recommendations on technical, commercial and contractual aspects of a Renewable Hybrid Project (the Project) and associated Power Purchase Agreement (new PPA) with an energy company, who is the current incumbent for provision of electricity under a PPA signed in 2004.

This report provides simplified cost comparisons for the generation of electricity that indicate that **the new PPA charge rate is around double that proposed by 3 companies with more experience and who were not permitted to tender**, for the same reliability, security and quality of supply. **The new PPA will also substantially increase State Government subsidies**.

Key points about the contract are:

a) The new PPA was signed on 30 March 2016, and will become active on Practical Completion of the Project (currently under construction and due for completion in July 2017);
b) The Project involves a combination of wind, solar and diesel generation along with batteries and control technology;
c) The new PPA contains charge rates for electricity generation, that averages circa **50c/kWh and forecast to increase to 100c/kWh over the 20 year life** of the PPA;
d) The **current cost of electricity generation is circa $3.4m per annum** (p/a). (Note distribution is managed by DCCP and is an additional cost);
e) The **new PPA will cost circa $5.8m p/a** – an increase of $2.4m p/a;
f) **No tender** for the provision of electricity was issued, despite interest and estimates from 3 more experienced companies in renewable hybrid projects;
g) **The budget estimate from the middle ranking company put the cost of electricity at $2.9m p/a**. ie. half the rate charged by the incumbent's new PPA;
h) An NPC over 20 years was undertaken by EC which included escalation and other factors. The total Project cost was forecast at $192m;
i) Resonant Solutions undertook a similar analysis and concluded that at least **$85m could be saved over the 20 year contract** had a tender been undertaken;
j) The SA State Government (DSD) has been a strong advocate for the Project and through the RAES scheme and Deed of Grant will fund the difference between Adelaide electricity prices and Coober Pedy's. This subsidy is currently around $3.5m p/a and will **increase by $2.4m when the new PPA takes effect**;
k) DSD and ARENA assured Council that "this was a good deal" "Council would be no worse off" as espoused by Project proponents
l) The Australian Renewable Energy Agency (ARENA), is providing $18.4m in capital grant funding;
m) Detailed reports indicate many additional risks of a technical, commercial and contractual nature with the new PPA, and are available subject to confidentiality.

Below is a spreadsheet showing simplified cost analysis of the new PPA vs the existing PPA vs an alternative tender bid.

Resonant Solutions (Pty) Ltd

ABN 79 142 624 968 www.reson.com.au

Energy, Project Governance, Engineering

Cost of Electricity. New Hybrid (70% renewables) vs current (2004) contract vs Alternative Bid

Electricity Charges as per PPA

	Hybrid (2016 PPA)			Current (2004 PPA)	
a	57429	p.m.	the Fixed Charge; (as per clause 20)	65920	$/pm (Dec2016 invoice)
b	0.0710	$/kWh	the Billing Period Variable Operating Charge;	0.0433	$/kWh (Dec2016 invoice)
c	0.4114	$/kWh	the Billing Period Variable Diesel Fuel Charge;	0.2947	$/kWh (Dec2016 invoice)
d	0.2508	$/kWh	the Billing Period Wind Turbine Charge;	0.17682	$/kWh (Dec2016 invoice)
e	158755	p.m.	the Billing Period Solar Fixed Charge; and	-	
f	169325	p.m.	the Billing Period New Wind Fixed Charge	-	

Energy Consumption for Coober Pedy

Average electricity demand	1400	kW	
Calculated forecast energy p.a.	12,264	MWh p.a.	calculated from above at 8760 hrs p.a.
Approximate Energy Demand 2016	**12,000**	**MWh p.a.**	**Basis of comparison for below**
Nordex 150 kW Wind generation	-	MWh p.a.	DISCONTINUED

Total charges based on an annual basis

		Hybrid Scenario 1	Current Contract	Alternative Vendor	
					(Alt Vendor same Ts and Cs as Hybrid)
	Fixed charge p.a.	689,148	791,045		$ AUD
	Solar Fixed charge p.a.	1,905,060	-		$ AUD
	Wind Fixed charge p.a	2,031,900	-		$ AUD
	Total forecast Fixed Charge	4,626,108	791,045		$ AUD
	Proportion New Wind	55.0%	0%	55%	% of electricity by new wind
	Proportion Solar PV	15.0%	0%	15%	% of electricity by PV
	Proportion Diesel	30.0%	100%	30%	% of diesel as per PPA
	Variable charge p.a.	852,221	519,600	-	MWh x 1000 x rate (b)
	Diesel Charge	1,480,962	3,453,600	-	kWh x percentage x (c)
	Total Variable Charge	2,333,183	3,973,200	-	
	Total Fixed charge	4,626,108	791,045	-	
	Total Forecast p.a.	**6,959,291**	**4,764,245**	**4,000,000**	**Payable to Vendor**
		0.58	**0.40**	**0.33**	Effective rate in c/kWh
Less	Fuel Credit Rebate	456,889	1,354,063	456,889	.401c/l. (3376716 litres p.a. for 100% diesel)
Less	LGC (used $80/MWh)	672,000	-	672,000	LRET (LGC) subject to continuation
	Total Cost to DCCP	**5,830,402**	**3,410,181**	**2,871,111**	**Cost to DCCP**
	Cost difference vs current PPA	**2,420,221**	**-**	**539,070**	**For DSD Account**
	Ave cost /kWh	**0.49**	**0.28**	**0.23**	Effective rate in c/kWh
	Diesel saved vs current	$ 2,011,371			@ $1.30/l less the rebate as at Jan 2017
	Increased Income to Incumbent:	$ 4,206,418			ie contribution to renewables capex

NB. 1 Diesel rebate and LGCs are for DCCP account - though these are at risk of cancellation. No Carbon price included

NB. 2 Scenario 1 represents the target of 70% renewable peneration with 30% diesel

NB. 3 Alternative Vendor costing is an approximation based on what could have been achieved if a tender had proceeded

NB. 4 For simplification, A 20 year NPV, IRR, DCF incorporating O&M, risk and discountinghas not been undertaken yet