Demand Management Investigation Report

Adamstown Zone

Including Kotara, Broadmeadow, and New Lambton zones.

Summary

EnergyAustralia carried out an investigation of demand management (DM) options, in the suburbs fed from Kotara, Broadmeadow and New Lambton Zones in 2008/09.

This report concludes that installation of the 2.4 MVA temporary generation system, into the existing Broadmeadow Zone, would be a cost effective option.

DM Requirements

A upgraded zone substation at Adamstown will provide additional capacity in the Newcastle suburbs of Tighes Hill, Waratah, Broadmeadow, Georgetown, Merewether, Burwood Beach, New Lambton and Lambton areas by summer 2010/2011. This will enable the existing Broadmeadow and Kotara zones loads to be reduced.

A Demand Management Screening test completed in January 2008 (refer Appendix "B") showed that the demand reductions required to enable the need for this project to be delayed were large and that it was not reasonable to expect that to be achievable.

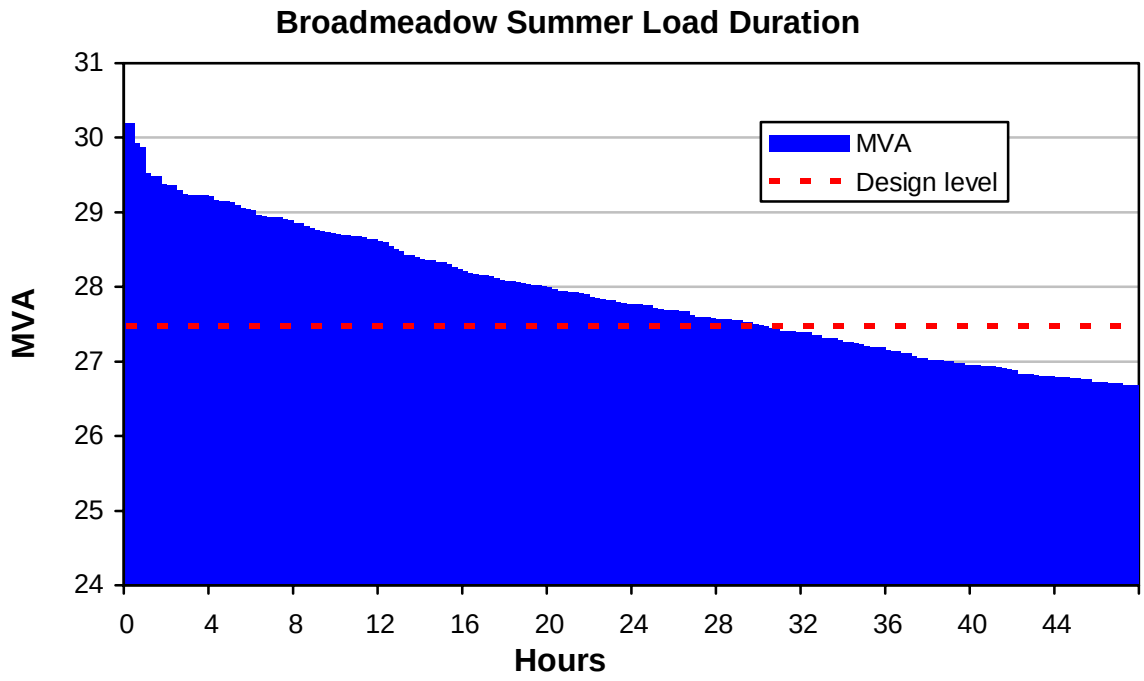
However, the forecast load at Kotara and Broadmeadow zone substations, would be above the level in the applicable planning design criteria in summer 2009/10.

Reductions in demand during this season would reduce the amount and duration of the load above the design level, reducing the possibility that customers would lose supply if a significant outage occurred during peak load times.

Based on the latest forecasts for Kotara and Broadmeadow, an aggregate reduction of 5.2 MVA across both zones would be required to reduce the forecast peak load to the design levels. While smaller reductions would not reduce the load to below the design levels at all times, there would be a proportional benefit, which can be calculated in terms of MVAh of load above the design level. Because load can readily be transferred from either of these zones to New Lambton zone, reductions in New Lambton would also be effective.

As an example, the following chart shows the forecast load duration curve for Broadmeadow Zone in summer 2009/10. It indicates that the load would be above the design level for 30 hours during summer 2009/2010, and for most of that period the difference would be less than 2 MVA. The total area above the line is 27MVAh.

Across both Broadmeadow and Kotara in summer 2009/10, there would be 31MVAh of load above the design level - 27 MVAh at Broadmeadow Zone and 4 MVAh at Kotara Zone. The level at which reductions in peak load would be considered cost effective is determined using a methodology that compares the proportional benefit from the reduction to the cost that would be incurred to bring forward the completion of the new Adamstown substation. This cost would be $2.8m and would eliminate all excess loads. Therefore, reductions would be cost effective below $90,000 for each MVAh of reduced excess load.

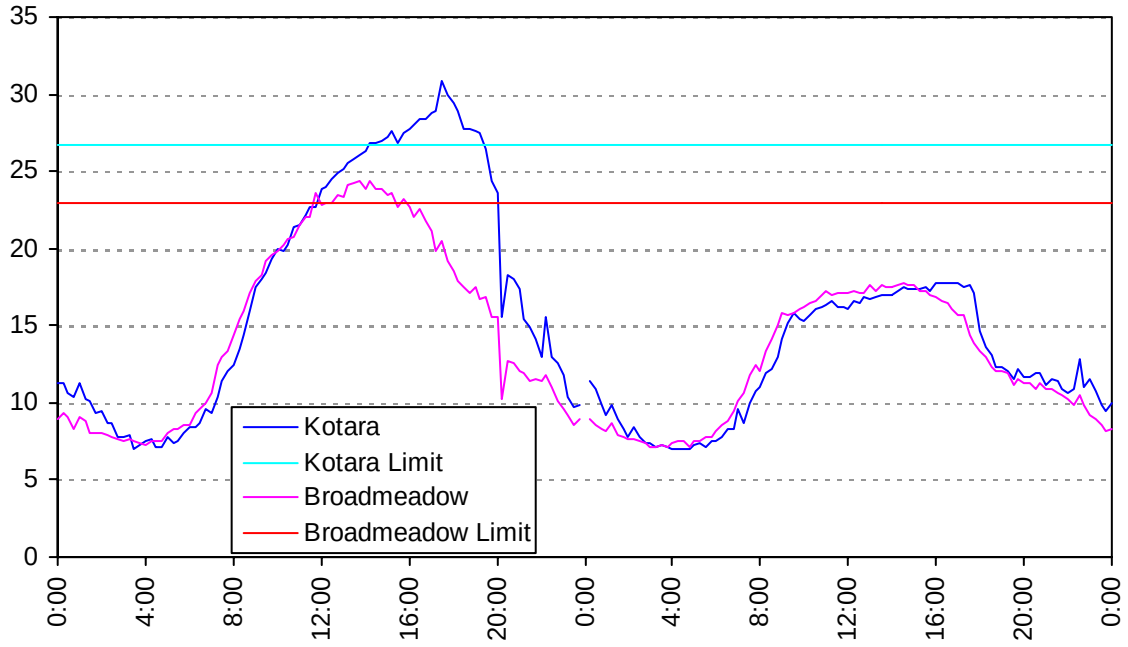


Kotara and Broadmeadow Zone Peak Load day Profiles

The following chart shows the individual summer peak load profiles which occurred simultaneously on the 15th January 2009. The load profiles suggest a roughly equal mixture of residential and commercial loads.

For the Broadmeadow Zone, any DM solutions would need to be effective during business days between 11:00am and 6:00pm in summer and for Kotara Zone slightly later, between 2:30pm and 8:30pm, also in summer.

Kotara and Broadmeadow Zone Peak Days 15& 16th January 2009



Demand Management Investigation and Approach

The overall investigation approach was to identify potential DM options, assess the likely size of the demand reduction and rank them based on their cost and effectiveness. The most cost-effective options might result in a feasible project. We identified major customers based on their maximum monthly peak demand, then visited the potential sites and collected information about the usage of energy and possible DM options. We visited the top 10 electricity customers in the Broadmeadow, Kotara and New Lambton Zone areas. Using all this information, we prepared a list of potential DM options for further development. For each of the options we assessed the likely size of demand reduction that would result at the time of network peak at the zone substation and calculated the impact on the amount of load above design limit. We also estimated the cost of implementing DM options to EnergyAustralia. Based on these estimates, we ranked the options and compared them to the benefits.

Identified DM options

- Power factor correction
- Temporary relocatable diesel generators
- Customers' standby generators

Demand Management Options and Analysis

Power Factor Correction (PFC)

During the period 2006 to 2008, Energy Australia under took a PFC program in the Newcastle area targeting customer's loads which exhibited a poor power factor PF. As part of this high level DM investigation, we rechecked the PF of the top ten customers in the Broadmeadow, Kotara and New Lambton Zones. No additional PFC projects were identified.

Temporary Relocatable Diesel Generators

EnergyAustralia has used relocatable generators to provide reliable temporary load reductions in other areas. In the event that large amount of peak electrical demand reduction is required, this would provide a reliable project that would be under our control and could be delivered at a well-defined cost.

We identified a potentially suitable location for installation of temporary generators (total 2.4 MVA), located at Broadmeadow Zone Substation and connected into the 11 kV feeders in Broadmeadow Road, approximately 30 meters away. Two options are considered viable and the estimated cost to EnergyAustralia is tabulated below:

Option	MVAh	Estimated DM Cost
Single 1.6 MVA generation	25.92	$700,000
Two X 1.2 MVA (2.4 MVA) generation	27.39	$900,000

Customer standby diesel generators

No generators were identified in the Broadmeadow and Kotara Zone Areas. However, in the adjacent New Lambton Zone up to 4.5 MVA of standby generation systems were inspected, with the view of forming an operating agreement with the owners to operate their generation equipment during agreed peak periods.

We have identified four customers with standby generation as outlined below, however only 0.75 MVA is suitable for parallel synchronised operation with our network.

- 1MVA at the Western Suburbs Leagues Club is designed for emergency generation for lights and power but not the air conditioning system. The system is >30 years old and is unlikely to be reliable enough to provide network support.
- 0.7 MVA at NIB Hospital is designed for load shedding on the light and power circuits only. It was noted that it is the Hospital's management policy to cancel all surgery during these times and maintain a minimal level of service to patients.
- 2.1 MVA at the John Hunter Hospital designed also for minimal hospital lighting and power for computer servers and fire fighting purposes etc. Discussion with the mechanical maintenance manager indicated that it would be unlikely for this standby generation to be available 100% of the time if EA's requested to operate during peak periods.
- 0.75 MVA at the John Hunter Hospital is a standby generator dedicated for parallel operation and it may be possible to negotiate a load curtailment agreement based on the use of the generator. To have an impact on the loads at Broadmeadow or Kotara, a load transfer would need to be implemented from New Lambton, which may increase the cost of using this option effectively.

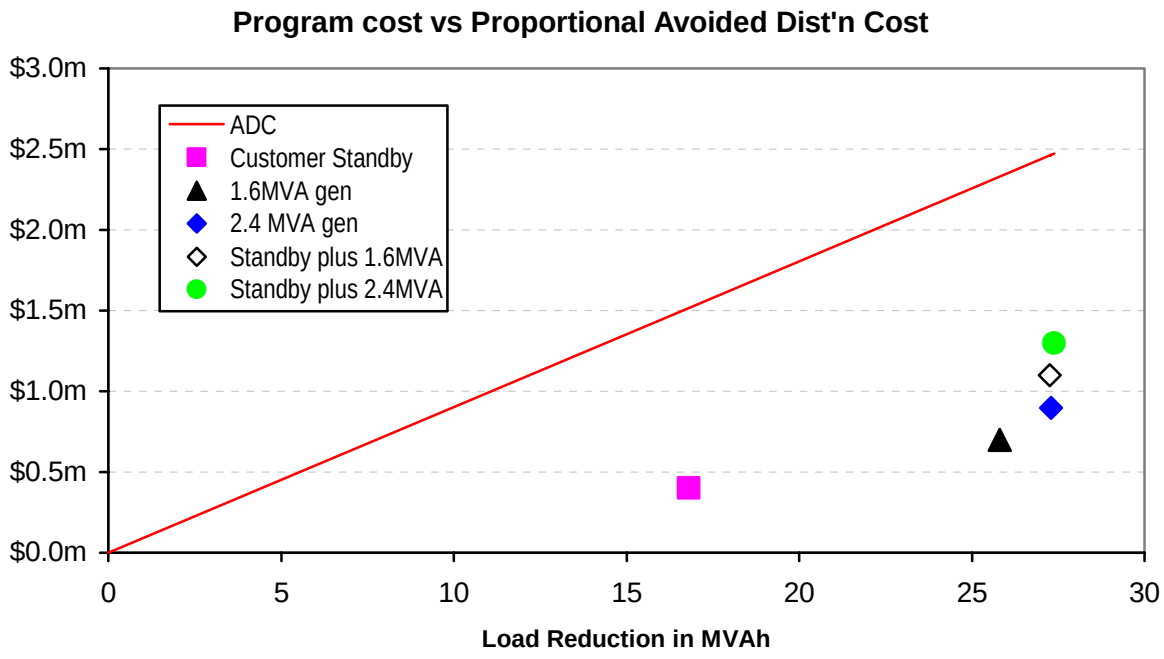
Summary of DM Project Cost and Load Reduction

The following table summarises results of our investigation results. We ranked the options according to their approximate cost effectiveness if each option was implemented on its own.

DM Options	Peak Load Reduction (summer)	Reduction MVAh	Cost to EA ($NPV)	Cost to EA ($/kVAh)
Customer standby generation for load curtailment	0.75MVA	16.8	$400,000	$24
Relocatable generator (1 unit)	1.6 MVA	25.8	$698,000	$27
Relocatable generator (2 units)	2.4 MVA	27.3	$896,000	$33
Relocatable generator (1 unit)	1.2 MVA	22.8	$758,000	$33
Relocatable generator (1 unit)	1.0 MVA	20.4	$721,000	$35

Based on this ranking, we have constructed a range of project portfolios and calculated the benefits from each. The results are summarised in the following table and on the chart below.

DM Options	Reduction (MVAh)	Cost to EA	Cost to EA ($/kVAh)	Proportional ADC benefit
Customer Standby Generation alone	16.8	$400,000	$24	$1,520,000
1.6MVA generator alone	25.8	$698,000	$27	$2,330,000
2.4 MVA generator alone	27.3	$896,000	$33	$2,460,000
Customer Standby plus 1.6MVA generator	27.3	$1,098,000	$40	$2,460,000
Customer Standby plus 2.4MVA	27.4	1,300,000	$47	$2,470,000



It is evident from this analysis that the option which provides the most attractive combination of cost and benefit is the installation of 2.4MVA of embedded generation in Broadmeadow Zone load area.

Conclusion

Based on the analysis it would be most beneficial to install a 2.4 MVA temporary generation system, into the existing Broadmeadow Zone before summer 2009/10.

APPENDIX A

Broadmeadow 33kV Zone Top 10 Site Inspections

1	Tighes Hill TAFE College Newcastle Campus
2	Mater Hospital
3	Goninan - United Group Rail Services
4	Newcastle Entertainment Centre
5	Jarvie Engineering
6	Newcastle Show Ground
7	FALK Australia
9	Goninan Platers
10	Tinonee Gardens Retirement Village

Kotara 33kV Zone Top 10 Site Inspections

1	Burwood Beach WWTW
2	AMP Property (Westfield Shopping Centre Kotara)
3	Woolworths Supermarket
4	AMP Property (Westfield Shopping Centre Kotara) House Lighting #1
5	David Jones (Westfield Shopping Centre Kotara)
6	Domayne (Harvey Norman Holdings)
7	Target Australia
9	Coles Myer
10	Telstra

New Lambton 33kV Zone Top 10 Site Inspections

1	John Hunter Hospital
2	Western Suburbs Leagues Club
3	Hunter Water Corp Pumping station
4	Hunter Private Hospital (Old NIB) Croudace Building & Kingston Building
5	Immunology Limb Nursing Centre
6	Newcastle City Council Lambton Swimming Pool
7	Ritchie's Store (Old IGA)
9	General Roberts Hotel
10	Bar 121 (old Snake Gully Hotel)

APPENDIX B

DEMAND MANAGEMENT SCREENING TEST

Adamstown 132/11kV Zone Substation

Current Supply Arrangements

Adamstown 33/11kV zone substation consists of two 25MVA transformers and is supplied from Merewether subtransmission substation (STS) at 33kV via three 33kV feeders.

Merewether STS supplies Adamstown, City Main, Kotara, Broadmeadow, New Lambton, Carrington, Charlestown, Cardiff, Dudley, Gateshead, Jewels, Pelican and Swansea zone substations. This 33kV system is interconnected with Waratah STS.

Summer is the critical season for the Merewether system, however winter loads are also approaching capacity limits. Under the applicable design planning criteria, capacity of Merewether STS is limited by the transformers to 274MVA in both summer and winter.

Adamstown zone is over 50 years old and requires major refurbishment or replacement as soon as practicable, with most of the equipment nearing the end of its serviceable life. The capacity of this zone substation is limited by the 11kV switchgear to 27.5MVA in summer and winter.

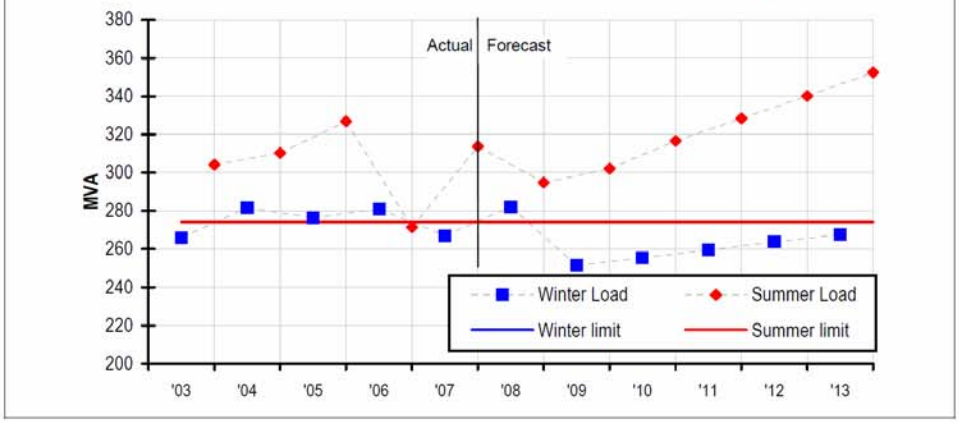
This system supplies a large area including most of the Newcastle urban area and a significant proportion of the eastern Lake Macquarie.

Supply Capacity and Demand Forecast

The load on the Merewether STS system is predominantly residential, with some commercial and industrial loads. Merewether STS and Adamstown zone substation experience summer afternoon and evening peaks.

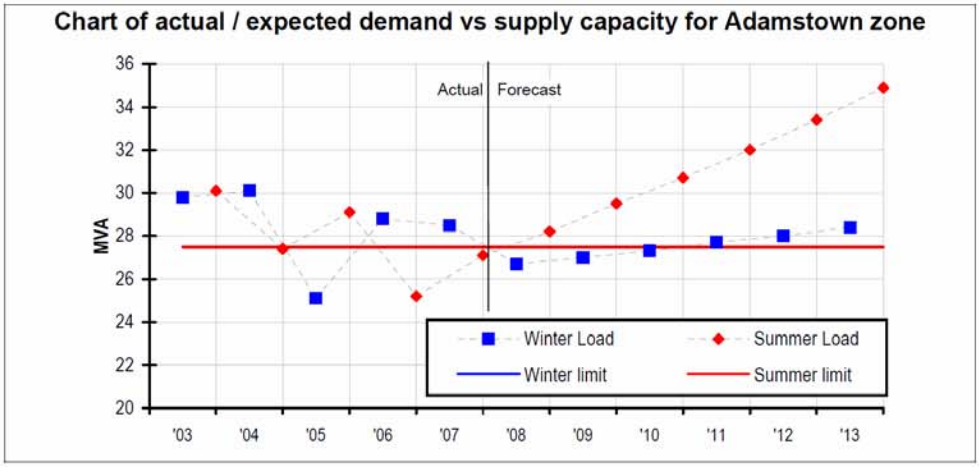
The forecast of peak demand and design limit for Merewether STS is shown on the chart below. In summer 2009/10 the peak load would be approximately 20.7MVA above the design planning limit, rising to 28.1MVA above the limit in summer 2010/11.

Chart of actual / expected demand vs supply capacity for Merewether STS



The forecast of peak demand and design limit for Adamstown zone substation is shown on the chart below. In summer 2009/10 the peak load would be approximately 2.0MVA above the design planning limit, rising to 3.2MVA above the limit in summer 2010/11.

Chart of actual / expected demand vs supply capacity for Adamstown zone



There are numerous other zones and 33kV feeders on the Merewether STS system where demand is forecast to exceed relevant limits in the near future, including Newcastle CBD, Kotara, New Lambton & Broadmeadow.

Supply Strategy Option

The preferred option is to construct a new 2 x 50MVA 132/11kV Adamstown zone substation supplied from the Merewether STS 132kV busbar to replace the existing Adamstown zone substation. The limit of the new substation will be 65MVA.

This will move load off Merewether STS, and the additional capacity at the new zone will allow load to be transferred to it from constrained adjacent zone substations.

It is anticipated that this project will be completed in March 2010 at an estimated cost of $24.6m. To meet this commissioning date, an investment decision must be made as soon as possible.

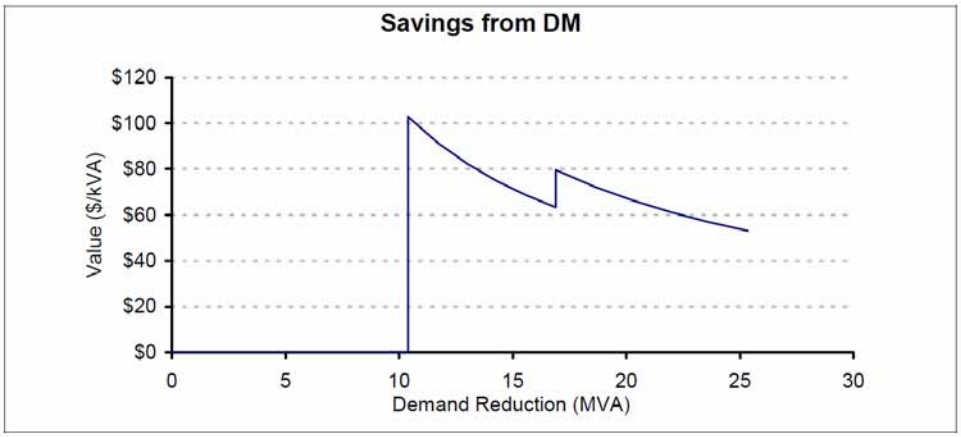
Required Demand Management Characteristics

Because the new Adamstown zone substation must be commissioned as soon as practicable due to aged asset issues, it is not possible to defer the project by reducing demand. However, reducing demand may enable an alternative area strategy including a smaller capacity substation at Adamstown. The smallest capacity 132/11kV substation option is a 2 x 37MVA transformer design, which is estimated to be $1.27m cheaper than a 2 x 50MVA design.

We have reviewed a number of demand reduction scenarios that would enable a smaller substation at Adamstown, including the effect on future investments on this part of the network. We have concluded that demand reductions of less than 10.4MVA would not be sufficient to enable an alternative strategy that had a net saving in capital costs, and therefore are not considered further in this report.

If at least 10.4MVA of demand reduction could be implemented by summer 2012/13 at Adamstown and/or adjacent zone substations, then this would enable the lower cost 2 x 37MVA substation to be built. This is around 5% of the total demand in this area. It would also be necessary to bring forward by one year the proposed busbar upgrades at Carrington and Newcastle CBD zones (from 2016 to 2015). This would result in a net saving of $1.07m, or $103/kVA.

If 16.9MVA of demand reduction could be implemented by summer 2012/13 at Adamstown and/or adjacent zone substations, then this would enable the lower cost 2 x 37MVA substation to be built. This is around 8% of the total demand in this area. No other changes to the area strategy would be required. This would result in a net saving of $1.34m, or $80/kVA.



The demand management requirement is large in total MVA, and moderately significant in relation to total demand in the area. The deferral value is low. There is little time to identify and develop DM options before the investment decision must be made.

On balance it is considered very unlikely that sufficient cost effective demand reductions could be identified to enable a smaller capacity and lower cost design at the new Adamstown zone substation.

Recommendation

Based on this analysis it is not considered reasonable to expect that it would be cost-effective to postpone the proposed supply-side solution by implementing demand management strategies.

However, demand reductions on this system may be cost effective as a means to reduce the likelihood of loss of supply in the event of a major outage prior to the commissioning of this project. A separate report will be prepared regarding this opportunity.