Authority for Budget (AFB) Supporting Documentation
Plant, Yard and Road Repair Maintenance
Northern California Power Agency

Current Situation and Need

Roads at the GEO require hot asphalt patching and resealing. In FY 15&16, much of the Plant 2 Yard was resurfaced, the main road from the entrance to Plants 1 and 2 were worked on and patching was done on the road to M site. The Easement road from Calpine onto the NCPA lease is maintained contractually by NCPA and Calpine reimburses 40% of the cost. An estimated $180,000 of work is needed on that road of which $128,000 will be the NCPA share. Fog Lines, Reflectors and berms need to be worked on in order to maintain the safe working conditions at the facility and the road to F, P, Q and H require attention.

Alternatives Evaluated

1. Work on the sections of Roads that require resealing, hot-patching and resurfacing.

2. Do nothing and allow the roads to deteriorate and spend additional money in the future to bring them back up to standards and safe to drive.

Alternative Selected

Invest in the roads now and do not let them deteriorate to the point that there is a safety issue and it costs more money in the future to bring them back up to standards.

Financial Analysis

This was considered a mandatory project to maintain the roads at the GEO in a safe operating condition. The cost for the repairs is estimated to be $250,000.

Non-Financial Benefits

The Safety of the persons driving the roads at the GEO

Recommendation

Staff recommends the Road Repairs be undertaken in FY 2017.

Authority for Budget (AFB) Supporting Documentation
Plant 1 Cooling Tower Structure Work
Northern California Power Agency

Current Situation and Need

The Plant 1 Cooling Tower has been in mostly continuous service for over 30 years.

The Deck on the top of the tower where the employees occasionally have to do work is in need of major maintenance. For the continued safe operation of the Cooling tower, some railing work needs to be done, the CT Distribution boxes need to be replaced and the trays need an overlay. The majority of the work will take place one cell at a time and will have a minimal effect on generation.

The expected cost of all of the work is $150,000.

Alternatives Evaluated

1. Do the work on the Cooling tower to enhance the safety of the structure.
2. Leave the Tower as is and repair it as it deteriorates.

Alternative Selected

Do the work on the Cooling tower to enhance the safety of the structure.

Financial Analysis

No financial analysis was done as this is a safety issue.

Non-Financial Benefits

The Safety of the persons walking on the Tower.

Recommendation

Staff recommends that $150,000 be budgeted in FY 17 so that the existing Plant 1 Cooling Tower can be worked on.

Authority for Budget (AFB) Supporting Documentation
Vehicle Replacements
Northern California Power Agency

Current Situation and Need

There is a need to replace older vehicles at the geothermal facility as they become unreliable. The vehicle that is used by our Operations Manager has over 110,000 miles and is at the point where its reliability is becoming problematic. We would like to replace that vehicle and if so that truck would go into the operations fleet for Geysers use. Another, older (142,746 miles) operations fleet vehicle would be put out for auction following NCPA's procedures. Additionally, there is an older two wheel drive mechanic/welders truck that is currently being used that would be replaced with a 4WD F350. GEO staff believes that, based on the cost of repairs and the issues surrounding reliability, it would be more cost effective to purchase a new vehicle and put the old one up for sale than to continue spending money and time fixing them.

Alternatives Evaluated

1. Replace the older vehicles.
2. Continue to use the existing vehicles until they now longer can be repaired.

Alternative Selected

Replace the existing vehicle and put the older vehicle up for sale following NCPA's procedures.

Financial Analysis

This was considered a mandatory project to maintain a reliable vehicle fleet at the GEO. The cost for the vehicles is estimated to be $100,000.

Non-Financial Benefits

The Safety of the persons driving the vehicle at the GEO.

Recommendation

Staff recommends that $100,000 be budgeted in FY 17 so that new vehicles can be purchased.

Authority for Budget (AFB) Supporting Documentation
Plant 1 HVAC
Northern California Power Agency

Current Situation and Need

NCPA Plant 1 HVAC system provides cooling for the Motor Control Centers of the facility. When the system is not working properly, the doors to those rooms have to be left open with large fans in service to keep the equipment from overheating. With the doors open and fans going, the equipment can be run, but it is exposing it to some corrosive gasses including H_2S. The combination of the high temperatures and gasses is shortening the potential lifespan of that equipment. An HVAC engineering contractor was employed to determine the best possible repair to be made on the system. His original engineering estimate for the system was $500,000. When staff went out for competitive bidding in May of 2015, the low bid was $1.5M. Staff decided to do a part of the original plan in FY16. That, in combination with changing several items in the design, should lower the price to complete the project in FY17 to $1,000,000. **Alternatives Evaluated**

1. Budget $900,000 to repair the Plant 1 HVAC in FY 17.
2. Continue to operate the facility without fixing the Plant 1 HVAC System.

Alternative Selected

Budget $1,000,000 to repair the Plant 1 HVAC in FY 17.

Financial Analysis

Repairing the Plant 1 HVAC is considered a mandatory project so no IRR was calculated. The total cost for the repair is estimated to be $1,000,000 in FY17.

Non-Financial Benefits

Limiting breaker degradation enhances the safety of the facility.

Recommendation

Staff recommends that $1,000,000 be budgeted in FY 17 so that the Plant 1 HVAC can be repaired.

Authority for Expenditure (AFE) Supporting Documentation
Access Platforms
Northern California Power Agency

Current Situation and Need

The NCPA geothermal facility has numerous valves, instruments and other devices that have been installed in locations that are difficult to access. Process and equipment considerations determined the optimum location of these devices, rather than accessibility.

NCPA employees have reached these devices using ladders, man-lifts and other equipment. Occasionally, the location of a device and weather conditions have conspired to compromise the safety of employees or delay work.
Rental of the Man lift is costly and when performance issues are suspected there is a delay between the time it is discovered and the delivery of a man lift. This delay can result in additional MW losses. Having the platforms will result in more performance checks which in turn will increase the productivity of the facility.

The installation of platforms in several locations will create easy, permanent access to devices that are currently hard to reach, promote safe work conditions and reduce work delays.

Alternatives Evaluated

1. Install platforms in several locations, to improve access to devices that are currently hard to reach.
2. Do nothing.

Alternative Selected

NCPA Staff recommends Alternative 1,

Financial Analysis

The total cost of installing the access platforms is estimated to be $150K. This total cost includes:

- $30K for design of the platform structures.
- $120K to install the platforms.

The design of the platforms will take place in the first half of FY2017. The installation of the platforms will take place in the second half of FY2017.

Financial analysis was based on the cost of renting a man lift to do performance checks and the Avoided loss of 2 MW twice per year for 2 days each occurrence due to fewer performance checks and the delay to get a man lift to the facility to check performance is an issue is suspected.

FINANCIAL EVALUATION SUMMARY	
Useful Life (Years):	25.00
IRR:	6.2%
Payback (years):	13.0
NPV @ 5%:	17,405
Est. Annual Benefits:	6,458

The primary benefit of installing the access platforms is improved safety, and the project has a 13 year payback due to increase MW production.

Non-Financial Benefits

The platforms will allow safe and permanent access to devices that are currently difficult to reach.

Recommendation

NCPA Staff recommends installing platforms to ensure that there is safe and permanent access to devices that are currently difficult to reach.

Financial Analysis for Generation Services projects exceeding $25,000.

Example 1: Capital Cost = $100,000, Financed = 50%, Cost of Money @ 5%, O&M =$1000/yr, O&M increase rate = 3%, Savings = $7,500 escalating at 2%, Life of Project 30 years.

Common Inputs:	Value	Units	Comments
Project Capital Cost	(150,000)	$	**Negative**
Amount Financed	0.0%	%	Applicable for the analysis, even if not borrowed.
Finance Life	25	Years	Term of Loan
Cost of Money	5%	%	Finance Rate. Currently assume 5%.
Project Life	25	Years	Useful life of Project
NCPA Discount Rate	5%	%	Investment Rate. Currently assume 5%.
O&M	0	$/Year	**Negative**
O&M Increase Rate in %	3.0%	% per Year	Currently Assume 3%
Revenue stream	0	$/Year	**Positive**
Benefits escalation in %	2.0%	% per Year	Currently Assume 2%
Annualized Payment Output:	0	$	Annualized payment used in the following cash flow "P&I Repayment" Row. Based on Financial Life, Capital Cost, Amount Financed, and Cost of Money

	Summary of Cash Flows (PV @ Discount Rate)	Cash Flow																				
Capital Cost		Beginning Year 1	Ending Year 1	Ending Year 2	Ending Year 3	Ending Year 4	Ending Year 5	Ending Year 6	Ending Year 7	Ending Year 8	Ending Year 9	Ending Year 10	Ending Year 11	Ending Year 12	Ending Year 13	Ending Year 14	Ending Year 15	Ending Year 16	Ending Year 17	Ending Year 18	Ending Year 19	Ending Year 20
Capital Cost	(144,048)	(25,000)	(125,000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P&I Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cost	**(144,048)**	**(25,000)**	**(125,000)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Expenses																						
Operation And Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expenses	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																						
Man-lift Rental	82,484		4,800	4,896	4,994	5,094	5,196	5,300	5,406	5,514	5,624	5,736	5,851	5,968	6,088	6,209	6,333	6,460	6,589	6,721	6,856	6,993
Avoided loss 2 MW 2 days 2 times a year, due to faster Perf checks	78,969	0	4,784	4,889	4,954	5,094	5,266	5,432	5,607	5,787	5,974	6,168	6,372	6,584	6,798	7,012	7,235	7,467	7,708	7,958	8,219	8,490
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Benefits	**161,453**		**9,584**	**9,785**	**9,948**	**10,188**	**10,462**	**10,732**	**11,013**	**11,300**	**11,597**	**11,905**	**12,223**	**12,552**	**12,885**	**13,221**	**13,568**	**13,927**	**14,297**	**14,679**	**15,075**	**15,483**
Net Cash Flow	17,405	**(25,000)**	**(115,416)**	**9,785**	**9,948**	**10,188**	**10,462**	**10,732**	**11,013**	**11,300**	**11,597**	**11,905**	**12,223**	**12,552**	**12,885**	**13,221**	**13,568**	**13,927**	**14,297**	**14,679**	**15,075**	**15,483**
Cumulative Cash Flow	-		**(140,416)**	**(130,631)**	**(120,683)**	**(110,495)**	**(100,034)**	**(89,302)**	**(78,289)**	**(66,989)**	**(55,391)**	**(43,486)**	**(31,263)**	**(18,711)**	**(5,826)**	**7,395**	**20,963**	**34,890**	**49,187**	**63,866**	**78,941**	**94,424**

The following table summarizes the financial measurements required in the AFE. These values are automatically copied to the AFE.

AFE Financial Measurements	Value	Units	Comments
NPV @ Discount Rate	**17,405**	$	Total PV Cost + Total PV Expense + PV Total Benefits. =C25+C30+C35
IRR	**6.2%**	%	Discount rate that results in a net present value of zero of a series of cash flows =IRR(E37:AI37)
Average Annual Benefits	**6,458**	$	Average Yearly Benefits. = C42/C11
Payback	**13.0**	Years	Number of Years of Negative Accumulative Cash Flow. =COUNTIF(F39:AI39,"<0")
Useful Life	**25.0**	Years	Useful Life of Project =C10
B/C Ratio	**1.12**	B/C Ratio	Benefit to Cost Ratio =C38/(C26+C32)

Authority for Expenditure (AFE) Supporting Documentation
Plant 1 Auxiliary Steam Pipeline Modification
Northern California Power Agency

Current Situation and Need

The auxiliary steam pipeline to Plant #1 comes from one dedicated steam well D-8. If the well is out of service, steam needs to be diverted from the main pipeline to operate the steam ejectors which pull non-condensable gases from the condensers. Eventually, steam production will decline to the point that it will be necessary to do this on a permanent basis. The reliability of the auxiliary steam system is limited by relying on one well to supply steam to the ejectors. Diverting steam production from the main steam pipeline reduces the generation output from the plant.

It is proposed that the auxiliary steam pipeline be modified to bring dedicated steam from more than one well and improve the reliability of the system.

Alternatives Evaluated

1. Modify the Auxiliary Steam Pipeline – Several wells will be tied into the auxiliary steam line and used as necessary to provide steam to the ejectors.

2. Do nothing – Steam production from D-8 will decline until it becomes necessary to supplement steam to the ejectors from the main steam line.

Alternative Selected

The selected alternative is to modify the auxiliary steam pipeline.

Financial Analysis

Assumptions used for the analysis are:

Project Life	20 years
Capital Investment	$100,000
Generation Gain	500 MWhrs annually declining at 2% per year

No project financing
Price Forecast per Power Settlements

Economic results are:

NPV @ 5%	$237,082
IRR	28.5%
Average Annual Benefits	$16,616
Payback	4 years

Non-Financial Benefits

None

Recommendation

It is recommended that the auxiliary steam pipeline be modified to provide dedicated steam production from more than one well.

Financial Analysis for Generation Services projects exceeding $25,000.

Example 1: Capital Cost = $100,000, Financed = 50%, Cost of Money @ 5%, O&M =$1000/yr, O&M increase rate = 3%, Savings = $7,500 escalating at 2%, Life of Project 30 years.

Common Inputs:	Value	Units	Comments
Project Capital Cost	(100,000)	$	**Negative**
Amount Financed	0.0%	%	Applicable for the analysis, even if not borrowed.
Finance Life	30	Years	Term of Loan
Cost of Money	5%	%	Finance Rate. Currently assume 5%.
Project Life	20	Years	Useful life of Project
NCPA Discount Rate	5%	%	Investment Rate. Currently assume 5%.
O&M	0	$/Year	**Negative**
O&M Increase Rate in %	3.0%	% per Year	Currently Assume 3%
Revenue stream	0	$/Year	**Positive**
Benefits escalation in %	2.0%	% per Year	Currently Assume 2%
Annualized Payment Output:	0	$	Annualized payment used in the following cash flow "P&I Repayment" Row. Based on Financial Life, Capital Cost, Amount Financed, and Cost of Money

	Summary of Cash Flows (PV @ Discount Rate)	Cash Flow Beginning Year 1	Ending Year 1	Ending Year 2	Ending Year 3	Ending Year 4	Ending Year 5	Ending Year 6	Ending Year 7	Ending Year 8	Ending Year 9	Ending Year 10
Capital Cost												
Capital Cost	(95,238)		(100,000)	0	0	0	0	0	0	0	0	0
P&I Repayment	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total Cost	**(95,238)**	**0**	**(100,000)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Expenses												
Operation And Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total Expenses	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits												
Generation Benefit	332,320	0	6,485	25,769	26,048	26,401	26,702	27,036	27,360	27,696	28,045	28,408
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total Benefits	**332,320**	**0**	**6,485**	**25,769**	**26,048**	**26,401**	**26,702**	**27,036**	**27,360**	**27,696**	**28,045**	**28,408**
Net Cash Flow	237,082	**0**	**(93,515)**	**25,769**	**26,048**	**26,401**	**26,702**	**27,036**	**27,360**	**27,696**	**28,045**	**28,408**
Cumulative Cash Flow	**-**		**(93,515)**	**(67,745)**	**(41,697)**	**(15,296)**	**11,406**	**38,442**	**65,802**	**93,498**	**121,543**	**149,950**

	Ending Year 11	Ending Year 12	Ending Year 13	Ending Year 14	Ending Year 15	Ending Year 16	Ending Year 17	Ending Year 18	Ending Year 19	Ending Year 20
Capital Cost										
Capital Cost	0	0	0	0	0	0	0	0	0	0
P&I Repayment	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total Cost	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Expenses										
Operation And Maintenance	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total Expenses	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits										
Generation Benefit	28,784	29,141	29,476	29,822	30,179	30,548	30,928	31,321	31,725	32,956
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total Benefits	**28,784**	**29,141**	**29,476**	**29,822**	**30,179**	**30,548**	**30,928**	**31,321**	**31,725**	**32,956**
Net Cash Flow	**28,784**	**29,141**	**29,476**	**29,822**	**30,179**	**30,548**	**30,928**	**31,321**	**31,725**	**32,956**
Cumulative Cash Flow	**178,734**	**207,875**	**237,350**	**267,172**	**297,351**	**327,899**	**358,828**	**390,148**	**421,873**	**454,829**

The following table summarizes the financial measurements required in the AFE. These values are automatically copied to the AFE.

AFE Financial Measurements	Value	Units	Comments
NPV @ Discount Rate	**237,082**	$	Total PV Cost + Total PV Expense + PV Total Benefits. =C25+C30+C35
IRR	**28.5%**	%	Discount rate that results in a net present value of zero of a series of cash flows =IRR(E37:AI37)
Average Annual Benefits	**16,616**	$	Average Yearly Benefits. = C42/C11
Payback	**4.0**	Years	Number of Years of Negative Accumulative Cash Flow. =COUNTIF(F39:AI39,"<0")
Useful Life	**20.0**	Years	Useful Life of Project =C10
B/C Ratio	**3.49**	B/C Ratio	Benefit to Cost Ratio =C38/(C26+C32)

Authority for Budget (AFB) Supporting Documentation
Boom Truck
Northern California Power Agency

Current Situation and Need
The NCPA Boom Truck that is presently at the GEO is older and the recent attempts to fix various issues with the truck have not resolved all of the issues. Due to this, the GEO has been renting a truck for our employees or calling a local operator to provide a truck and operator so that maintenance can continue at the facility. At present, staff estimates that when we have a running boom truck, it is used 2-3 times a week at least 40 weeks a year. Renting a truck by the week could lessen that to weeks a year. We have analyzed for the long term vs. owing one for hiring a contractor to provide a truck and operator. The analysis shows that purchasing a truck makes the most economic sense for the facility.

Alternatives Evaluated

1. Replace the older, mechanically unsound vehicle.
2. Rent a Boom Truck to be used at the facility.
3. Hire a contractor to provide a truck and operator when the need arises.

Alternative Selected

Replace the existing Boom Truck and put the older vehicle up for sale per the NCPA surplus procedure.

Financial Analysis

Renting a truck for the long term vs. owing one was analyzed as was hiring a contractor to provide a truck and operator and it was determined that purchasing a truck makes the most economic sense for the facility. The Cost of a newer Boom Truck should be about $175,000. The below is the economics based on the contractor providing the boom truck.

AFE Financial Measurements	Value	Units
NPV @ Discount Rate	**359,368**	$
IRR	**44.0%**	%
Average Annual Benefits	**49,048**	$
Payback	**2.0**	Years
Useful Life	**10.0**	Years
B/C Ratio	**3.74**	B/C Ratio

Non-Financial Benefits
The Safety of the persons driving the vehicle at the GEO.

Recommendation
Staff recommends that $175,000 be budgeted in FY 17 so that a Boom Truck can be purchased.

Financial Analysis for Generation Services projects exceeding $25,000.

Example 1: Capital Cost = $100,000, Financed = 50%, Cost of Money @ 5%, O&M =$1000/yr, O&M increase rate = 3%, Savings = $7,500 escalating at 2%, Life of Project 30 years.

Common Inputs:	**Value**	**Units**	**Comments**
Project Capital Cost	(175,000)	$	**Negative**
Amount Financed	0.0%	%	Applicable for the analysis, even if not borrowed.
Finance Life	30	Years	Term of Loan
Cost of Money	5%	%	Finance Rate. Currently assume 5%.
Project Life	10	Years	Useful life of Project
NCPA Discount Rate	5%	%	Investment Rate. Currently assume 5%.
O&M	0	$/Year	**Negative**
O&M Increase Rate in %	3.0%	% per Year	Currently Assume 3%
Revenue stream	0	$/Year	**Positive**
Benefits escalation in %	2.0%	% per Year	Currently Assume 2%
Annualized Payment Output:	0	$	Annualized payment used in the following cash flow "P&I Repayment" Row. Based on Financial Life, Capital Cost, Amount Financed, and Cost of Money

	Summary of Cash Flows (PV @ Discount Rate)	**Cash Flow**																				
Capital Cost		**Beginning Year 1**	**Ending Year 1**	**Ending Year 2**	**Ending Year 3**	**Ending Year 4**	**Ending Year 5**	**Ending Year 6**	**Ending Year 7**	**Ending Year 8**	**Ending Year 9**	**Ending Year 10**	**Ending Year 11**	**Ending Year 12**	**Ending Year 13**	**Ending Year 14**	**Ending Year 15**	**Ending Year 16**	**Ending Year 17**	**Ending Year 18**	**Ending Year 19**	**Ending Year 20**
Capital Cost	(175,000)	(175,000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P&I Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cost	**(175,000)**	**(175,000)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Expenses																						
Operation And Maintenance	43,887	1,000	1,050	2,550	2,678	4,178	4,386	5,886	6,181	7,681	8,065	9,565	0	0	0	0	11,088	0	0	0	0	0
Emplyee physical costs/loss of productionn	11,000	1,000	1,050	1,103	1,158	1,216	1,276	1,340	1,407	1,477	1,551	1,629	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expenses	**54,887**	**2,000**	**2,100**	**3,653**	**3,835**	**5,393**	**5,663**	**7,226**	**7,588**	**9,158**	**9,616**	**11,194**	**0**	**0**	**0**	**0**	**11,088**	**0**	**0**	**0**	**0**	**0**
Benefits																						
Reduced Rental	477,793	50,000	51,000	52,020	53,060	54,122	55,204	56,308	57,434	58,583	59,755	60,950	0	0	0	0	0	0				
														0	0	0	0	0	0	0	0	0
														0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Benefits	**477,793**	**50,000**	**51,000**	**52,020**	**53,060**	**54,122**	**55,204**	**56,308**	**57,434**	**58,583**	**59,755**	**60,950**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Cash Flow	357,681	**(123,000)**	**53,100**	**55,673**	**56,896**	**59,515**	**60,867**	**63,535**	**65,022**	**67,741**	**69,371**	**72,143**	**0**	**0**	**0**	**0**	**11,088**	**0**	**0**	**0**	**0**	**0**
Cumulative Cash Flow	-		**(69,900)**	**(14,228)**	**42,668**	**102,183**	**163,049**	**226,584**	**291,606**	**359,347**	**428,718**	**500,861**	**500,861**	**500,861**	**500,861**	**500,861**	**511,949**	**511,949**	**511,949**	**511,949**	**511,949**	**511,949**

The following table summarizes the financial measurements required in the AFE. These values are automatically copied to the AFE.

AFE Financial Measurements	**Value**	**Units**	**Comments**
NPV @ Discount Rate	**357,681**	$	Total PV Cost + Total PV Expense + PV Total Benefits. =C25+C30+C35
IRR	**45.4%**	%	Discount rate that results in a net present value of zero of a series of cash flows =IRR(E37:AI37)
Average Annual Benefits	**47,779**	$	Average Yearly Benefits. = C42/C11
Payback	**2.0**	Years	Number of Years of Negative Accumulative Cash Flow. =COUNTIF(F39:AI39,"<0")
Useful Life	**10.0**	Years	Useful Life of Project =C10
B/C Ratio	**3.98**	B/C Ratio	Benefit to Cost Ratio =C38/(C26+C32)

Authority for Expenditure (AFE) Supporting Documentation
Unit 4 Main Steam Pipeline
Northern California Power Agency

Current Situation and Need

Steam delivered to the Unit #4 turbine drops in pressure 3.2 psig from steam separators outside the plant fence line to the turbine building. Numerical modeling and in-house calculations show that approximately half of this pressure drop can be eliminated and approximately 1 MW of generation recovered if the Unit #4 main steam pipeline is shortened and re-routed directly to the turbine building.

The project will need to be done in three phases due to the long lead time in getting a 48” valve required for the pipeline.

Phase 1 - A 48” tie-in point on the existing Unit #4 main steam pipeline will be established and a 36” branch connection will be relocated. This work will be done during the April 2016 outage to avoid any loss in generation.

Phase 2 - The majority of the new Unit #4 pipeline will be constructed while Unit #4 is on line.

Phase 3 – Unit #4 will be taken off line so that the new pipeline can be connected to the Phase 1 tie-in point and redirected into the Unit #4 turbine building. Existing valves and flow meter will be relocated with power and instrumentation hooked up. The duration of Phase 3 is expected to take as much as ten days, but may be shorter.

It is proposed that the Unit #4 main steam pipeline be modified to bring steam directly to the turbine building.

Alternatives Evaluated

1. Modify the Unit #4 Main Steam Line – The Unit #4 pipeline will be constructed in phases to take advantage of unit outages. A 1 MW generation gain will be realized.
2. Do nothing – Plant #2 will continue to incur a 3.2 psig pressure drop from the existing steam piping.

Alternative Selected

The selected alternative is to modify the Unit #4 main steam pipeline.

Financial Analysis

Assumptions used for the analysis are:

Project Life	15 years
Capital Investment	$950,000
Generation Gain	1 MW annually declining at 2% per year

No project financing
Price Forecast per Power Settlements

Economic results are:

NPV @ 5%	$3,095,366
IRR	30.8%
Average Annual Benefits	$298,202
Payback	4 years

Non-Financial Benefits

None

Recommendation

It is recommended that the Unit #4 main steam pipeline be shortened and re-routed to go directly to the turbine building.

Financial Analysis for Generation Services projects exceeding $25,000.

Example 1: Capital Cost = $100,000, Financed = 50%, Cost of Money @ 5%, O&M =$1000/yr, O&M increase rate = 3%, Savings = $7,500 escalating at 2%, Life of Project 30 years.

Common Inputs:	Value	Units	Comments
Project Capital Cost	(950,000)	$	Negative
Amount Financed	0.0%	%	Applicable for the analysis, even if not borrowed.
Finance Life	30	Years	Term of Loan
Cost of Money	5%	%	Finance Rate. Currently assume 5%.
Project Life	15	Years	Useful life of Project
NCPA Discount Rate	5%	%	Investment Rate. Currently assume 5%.
O&M	0	$/Year	Negative
O&M Increase Rate in %	3.0%	% per Year	Currently Assume 3%
Revenue stream	0	$/Year	Positive
Benefits escalation in %	2.0%	% per Year	Currently Assume 2%
Annualized Payment Output:	0	$	Annualized payment used in the following cash flow "P&I Repayment" Row. Based on Financial Life, Capital Cost, Amount Financed, and Cost of Money

	Summary of Cash Flows (PV @ Discount Rate)	Cash Flow																				
Capital Cost		Beginning Year 1	Ending Year 1	Ending Year 2	Ending Year 3	Ending Year 4	Ending Year 5	Ending Year 6	Ending Year 7	Ending Year 8	Ending Year 9	Ending Year 10	Ending Year 11	Ending Year 12	Ending Year 13	Ending Year 14	Ending Year 15	Ending Year 16	Ending Year 17	Ending Year 18	Ending Year 19	Ending Year 20
Capital Cost	(919,048)	(300,000)	(650,000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P&I Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cost	**(919,048)**	**(300,000)**	**(650,000)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Expenses																						
Loss of 30 MW generation for 10 days	(458,619)	0	(481,550)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Expenses	**(458,619)**	**0**	**(481,550)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																						
Increased Generation of 1 MW, Unit 4	4,473,033	0	93,676	440,851	437,934	442,676	448,676	453,779	459,465	464,959	470,672	476,608	482,769	489,159	495,232	500,922	506,803	512,876	519,145	525,610	532,275	539,142
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Benefits	**4,473,033**	**0**	**93,676**	**440,851**	**437,934**	**442,676**	**448,676**	**453,779**	**459,465**	**464,959**	**470,672**	**476,608**	**482,769**	**489,159**	**495,232**	**500,922**	**506,803**	**512,876**	**519,145**	**525,610**	**532,275**	**539,142**
Net Cash Flow	1,781,307	**(300,000)**	**(1,037,874)**	**440,851**	**437,934**	**442,676**	**448,676**	**453,779**	**459,465**	**464,959**	**470,672**	**476,608**	**482,769**	**489,159**	**495,232**	**500,922**	**506,803**	**512,876**	**519,145**	**525,610**	**532,275**	**539,142**
Cumulative Cash Flow	-		**(1,337,874)**	**(897,023)**	**(459,088)**	**(16,412)**	**432,263**	**886,043**	**1,345,508**	**1,810,467**	**2,281,140**	**2,757,748**	**3,240,517**	**3,729,675**	**4,224,907**	**4,725,829**	**5,232,632**	**5,745,508**	**6,264,653**	**6,790,263**	**7,322,538**	**7,861,680**

The following table summarizes the financial measurements required in the AFE. These values are automatically copied to the AFE.

AFE Financial Measurements	Value	Units	Comments
NPV @ Discount Rate	**3,095,366**	$	Total PV Cost + Total PV Expense + PV Total Benefits. =C25+C30+C35
IRR	**30.8%**	%	Discount rate that results in a net present value of zero of a series of cash flows =IRR(E37:AI37)
Average Annual Benefits	**298,202**	$	Average Yearly Benefits. = C42/C11
Payback	**4.0**	Years	Number of Years of Negative Accumulative Cash Flow. =COUNTIF(F39:AI39,"<0")
Useful Life	**15.0**	Years	Useful Life of Project =C10
B/C Ratio	**3.25**	B/C Ratio	Benefit to Cost Ratio =C38/(C26+C32)