DECOMMISSIONING STUDY FOR LODI CT1

DRAFT Capital Cost Estimate

B&V PROJECT NO. 193130
B&V FILE NO. 40.0000

PREPARED FOR

Northern California Power Agency

DECEMBER 30, 2016

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Executive Summary

Black & Veatch has evaluated the potential costs to decommission and demolish Lodi CT1[1] and has defined other associated issues. This study includes the following activities associated with retiring CT1 Lodi:

- Decommissioning – Analyze the Lodi CT1 systems to determine cost effective options for demolition and salvage of materials.
- **Environmental –** Identify potential environmental hazards associated with Lodi CT1.
- **Capital Cost Estimate –** Develop cost estimates for demolition of plant equipment in today's dollars and, using Producer Price indexes, project future project capital costs.

For the purpose of this study, retirement and decommissioning both refer to the formal process of removing an electric generating unit, and other associated equipment, from active service in a manner that it can no longer be used to generate electricity. Demolition is defined as the tearing down and removal of equipment, buildings, and structures (while potentially preserving valuable components and materials for reuse). Demolition does not refer to the process or actions taken to remove a piece of equipment for resale and reuse, which is more involved and typically requires skilled labor.

Black & Veatch has determined that the estimated capital cost to decommission and demolishing of CT1 is estimated at $5,800,000.

[1] This retirement, decommissioning, and demolition study is not intended to be, and should not be construed as, advice concerning legal obligations or a recommendation concerning the timing, scope or necessity to conduct any related activity. Black & Veatch has assumed that the limited information, both verbal and written, provided by others is complete and correct; however, Black & Veatch does not guarantee the accuracy of the information, data, or opinions contained herein.

1.0 Introduction

1.1 FACILITY DESCRIPTION

The Lodi CT1 facility is located in Lodi, California within San Joaquin County and owned and operated by Northern California Power Agency (NCPA). This facility is a 1x0 Peaker utilizing a Frame 5 in a Nuevo Pignone package. The gas turbine is dual fuel fired from either natural gas, supplied by Pacific Gas & Electric at an on-site interconnection, or by diesel fuel stored in an on-site storage tank. It uses water injection and has an evaporative cooler. There is a diesel engine used as a starting motor and the facility uses a FM200 fire protection system. Water and waste water are serviced by the City of Lodi through city interconnections on-site.

2.0 Lodi CT1 Demolition Project Approach

Black & Veatch's project approach was split into several tasks. These include:

- Review of data provided by NCPA.
- Desktop review of demolition of Lodi CT1.
- Consider environmental hazards associated with the Lodi CT1 demolition process.

Black & Veatch's approach to estimate these costs was based on the use of a proprietary estimating spreadsheet developed for previous generating station decommissioning and demolition studies. Where possible, configuration data from Lodi CT1's drawings, and other technical resources provided by the NCPA was used to populate the spreadsheet. When site specific data was not available, typical data was supplemented from Black & Veatch in-house databases and information from previous projects. A general set of decommissioning assumptions was developed to guide the basis of the analysis based on the project kick-off conference call held on July 28, 2016. These discussions focused on safety and security requirements, potential hazardous materials that would be encountered during demolition, any equipment to remain in service (if applicable), and final site condition requirements.

The retiring and disposing of a power plant can require close coordination with the regulatory agencies. There are several groups which administer regulations associated with air quality, surface water quality, ground water quality, solid waste management, hazardous waste, and petroleum storage tanks. There are no regulations which relate specifically to the dismantling of electric generating plants. The existing permits may contain limited closure guidelines or specific conditions. However, as more power generating facilities are retired these requirements could evolve in future years. Black & Veatch did not consult with or seek clarification from government agencies to confirm current or future anticipated decommissioning permitting requirements and processes. Therefore, during the next phase of the study, it is recommended that NCPA work closely with the various agencies during the planning stage to identify and negotiate specific closure requirements.

A decommissioning and demolition (D&D) plan, including a constructability analysis, was not completed as part of this estimate. It is recommended for the next phase of this project that a D&D plan is developed as it is a valuable roadmap to the deconstruction, final functionality (as applicable), and appearance of the facility and is recommended as part of any future project. This document can further define the project and enhance the accuracy of the cost estimate.

Based on discussions with NCPA, the Lodi CT 1 facility equipment was broken down into four groups which are reasonable depictions of facility systems for the purposes of this estimate. The systems for each group include the following and are illustrated in Appendix A:

- Group 1 includes fuel oil tank, fuel oil berm, fuel oil forwarding skid and fuel oil filter skid.
- Group 2 includes natural gas line connection, gas compressor, combustion turbine, oil chiller, other combustion turbine equipment, switch building and on-site transmission.
- Group 3 includes demineralization buildings, demineralization tank, other water treatment equipment, admin building and other miscellaneous buildings.
- Group 4 includes plant entrance road and related items.

The following sections describe the assumptions and observations based on review of the available information and the site visit conducted on August 23, 2016 to support this cost estimate.

2.1 SCENARIO SPECIFIC ASSUMPTIONS

For purposes of the cost estimate, Black & Veatch's general assumptions include the following:

- The cost estimate has an accuracy level equivalent to AACE Class 4.
- The availability of supporting information for the decommissioning study was limited. This includes quantities and weights of equipment and materials, Engineering Data Manuals, and construction contractor "close-out" manuals or reports. Wherever specific quantities were not readily available, Black & Veatch used estimates and typical quantities based on our experience and previous projects to populate the cost development spreadsheets.
- The Lodi CT1 equipment to be decommissioned and demolished will be modified and put into in a safe and secure condition by NCPA with no effort to preserve the equipment for later return to service or sale of equipment on the grey market.
- All equipment and materials are considered for scrap value only; no equipment salvage values were utilized. No resale or reuse of the plant components was included as part of the costs.
- Nonessential equipment and systems will be prepared by NCPA for permanent shutdown and removal.
- Where possible, nonhazardous (non-salvageable) materials from the decommissioning and demolition activities will be disposed off-site in a nearby landfill. Costs have been included to haul materials up to a distance of 50 miles.
- Based on discussions with NCPA personnel, it has been assumed that hazardous materials are not present at the facility and hazardous materials will not need disposal.
- Concrete and asphalt materials will not be used as on-site backfill material, but rather will be hauled to a landfill.
- The estimate assumes that all concrete and rebar will be taken off site by the demolition contractor and none will be pulverized and recycled on-site.
- All materials and equipment used to operate the Lodi CT1 equipment will be removed by NCPA and associated costs or revenue are not included in the estimate. These include:
    - Plant operating fuels (i.e., fuel oil).
    - Chemicals.
    - Fluids in tanks, pipes, barrels, storage areas, and other container and media.
    - Spare parts, tools, etc.
    - Any equipment that is not tied down by anchor to the foundation.
    - All mobile equipment and vehicles (as applicable).
    - Disposal of office furniture, office equipment, and spare parts inventory were not considered.
- The estimate assumes that all the identified plant systems for decommissioned equipment will be de-energized, drained and tagged-out of service by NCPA.

- Construction power and potable and non-potable water is assumed to be available at the facility for decommissioning activities.
- The facility's current security fence will be used during construction to control access to the decommissioned area during demolition activities and will be removed for final site grading.
- Plant insurance, legal fees, permits, and property tax adjustments, other administrative fees, and other potential community engagement costs are not included.
- The duration of this decommissioning scenario is 12 months.

2.1.1 Civil/Structural Observations

2.1.1.1 Scenario Specific Assumptions

- All foundations will be completely removed.
- Gas, water, and sewer lines will be completely removed from the plant to where they connect to the city or PG&E located along the road (W Turner Road) to the South of the plant.
- The access road and rail road tracks to the East of the plant will be removed and replaced in kind In order to gain access to the utility pipes.
- All gravel and asphalt located within the site will be removed to native soil. New top soil will be added in order to bring the site back to natural grade.
- Site will be seeded with native grass or vegetation.

2.1.1.2 Civil/Structural Observations

The demolition of Lodi CT1 plant will consist of a complete removal of all buildings, foundations, and utilities and returning the site to natural conditions. All structures and foundations will be completely removed and backfilled with clean native soil. The area will then be replanted with native vegetation. To help facilitate the removal of the equipment the area to the south of the turbine can be used as a laydown area for waste material and for a crane. All demolition activities should be able to be contained inside the existing NCPA boundaries and additional land for laydown should not be required.

The access road/rail road tracks to the east of the plant will need to be removed in order to remove the natural gas, waste water, and water lines. We suggest that NCPA evaluate these lines and see if complete removal is necessary or if they can be abandoned in place in order to save the cost of removal and replacement of the road/tracks.

2.1.2 Mechanical Observations

Lodi CT 1 is a simple cycle unit with no complication for demolition regarding mechanical items.

The following major equipment will be removed during the demolition process:

- Combustion Turbine.
- Gas Compressor including Fuel Gas Receiver, Fuel Gas Filter.
- Fuel Gas Metering Station.

- Fuel Oil Storage Tank.
- Fuel Transfer Pumps.
- Fuel Oil Filter Skid.
- Fuel Forwarding Pumps.
- Fuel Oil Head Tank.
- Air Compressor Skid including a Compressor, a Dryer and a Receiver.
- Lube Oil Cooler.
- Demineralizer Water Storage Tank.
- Demineralizer Water Chemical Skid.
- Water Injection Skid.

2.1.3 Electrical Observations

Electrical and Control scope at Lodi CT1 includes removal of all the electrical generation and unit distribution systems. The removal includes all the associated cable, raceway and miscellaneous components connected to these equipment. The plant lighting and grounding system has also been identified for removal.

Please note the following:

- The 480V back feed power comes from a separate pole, from the City of Lodi.
- The current switchyard is owned by the City of Lodi. The decommissioning will be from the disconnect switch inside the plant property line and the lines from the disconnect switch to the Lodi switchyard will be removed.
- The Sulfuric Acid Batteries at the turbine will be disconnected and disposed by NCPA prior to the demolition and is not included in the estimate.

2.1.3.1 Removal of CT1 Equipment

The following is a list of major electrical equipment that has been identified for removal:

- AC BOPER Motor Control Center 480V, 600A - Manufacture SIEMENS-ALLIS 115.
- AC Motor Control Center 480V, 800A - Furnished by Owner & Installed by GE.
- 4.16kV Gas Compressor Switchgear.
- Main Transformer 32MVA 13.4kV-60kV.
- (2) Service Transformers 300kVA, 13.8kV-480V.
- Service Transformer B, 1000kVA, 13.8kV-4.16KV.
- Back feed XFMR 12kV-480V.
- 480-220V, Transformer.
- Metering Panel Back feed.
- (2) Relay Control Panels.

- AC Power Panel.
- DC Power Panel.
- (9) Distribution Panels.

2.2 COST ESTIMATE

2.2.1 Estimate Description

The decommissioning and demolition costs provided in Table 2-1 were prepared based on the assumptions and observations defined in this report. The estimate is expressed as overnight costs and exclude any forward escalation. The estimates are considered to have an AACE Class 4 accuracy level.

2.2.2 General Cost Estimate Assumptions/Clarifications

- The cost estimate is primarily based on a dismantling method that utilizes torches, shears, and other heavy equipment rather than generally utilizing explosives.
- The plant has sufficient lay down areas for staging demolition equipment, a contractor trailer, and temporary storage and breakdown of demolished materials. The area identified is the area south of the combustion turbine and along the entry road to the facility.
- Credits for the resale of scrap metals is included for structural steel, tank metals, compressors, pumps, piping & valves, cable and conduit and electrical equipment.
- The estimate assumes that all scrap metal, such as: structural steel, miscellaneous steel, conduit, cable, piping, valves and equipment, will be cut to size on site for transporting in roll-off containers and 40' trailers for transporting to the nearest landfill and/or recycling centers (assumed within 50 miles of the plant). Costs for transportation are included in the scrap unit pricing in 2016 dollars.
- Scrap prices for materials can be estimated when detailed material quantities are available from historical data from previous demolition study estimates, vendor estimates, or industry internet sites like Iron Mike's Scrap Metal Services. Due to the limited detail material quantity information scrap value pricing was based on a combination of current internet pricing and 5 percent to 25 percent of the demolition costs were assumed for various equipment and materials. It should be noted that scrap values are subject to change based on daily market conditions. The combustion turbine equipment scrap value is assumed to be approximately $4.5 Million.
- All costs are expressed in current day December 2016 U.S. dollars. Escalation is not included in this cost but is addressed in the next section.
- Wage rates are based on the state of California's Department of Industrial Relations labor rates[2]. A labor study was not performed.
- Direct costs include the costs associated with equipment rental, demolition and all contractor services.
- Demolition costs for the estimate include all contractor overhead, staff, indirect costs, and profit.
- The decommissioning cost estimates are based on an EPC contracting approach.

[2] http://www.dir.ca.gov/OPRL/2016-2/PWD/index.htm

- Contingency of 15 percent is included as an allowance for site unknowns. Time constraints and limited plant-specific information are the primary drivers of this level of contingency. This added contingency value is independent of the project costs estimate, confidence level for estimate accuracy, and goes beyond the noted project assumptions. This value has been included to capture those unforeseen project costs not identified within the scope of the project.

The estimates are based on limited information provided and supplemented with Black & Veatch estimate data for similar type and size units. Salvage value estimates are based on typical salable materials and estimate quantities. Decommissioning costs and salvage values are presented in 2016 dollars. Table 2-1 summarizes the estimated decommissioning and demolition costs for the project.

2.2.3 Special Considerations

Several special considerations could alter these estimated decommissioning costs, including on-site investigation, identification of actual equipment and material weights, changes in environmental legislation, changes in economic considerations such as labor rates, demolition costs, or scrap values, changes disposal regulations/methods, costs for hazardous materials abatement (if found to be applicable), changes in contracting methodology, allocations for engineering and construction management, project contingency costs, changes to the location demolition materials are disposed, or a change in the future use of the site.

Table 2-1 Decommissioning and Demolition Capital Cost Estimate Summary

	LABOR COST	SUBCONTRACTOR COST	SALVAGE COST	TOTAL
Group 1	$301,000	$199,000	-$28,000	$472,000
Group 2	$4,643,000	$231,000	-$5,273,000	-$399,000
Group 3	$454,000	$361,000	-$95,000	$720,000
Group 4	$161,000	$39,000	-$15,000	$185,000
Demo Subtotal	$5,559,000	$830,000	-$5,411,000	$978,000
Construction Indirects	--	--	--	$2,390,000
Construction Equipment	--	--	--	$1,112,000
Engineering & Construction Management (10%)	--	--	--	$556,000
Contingency (15%)	--	--	--	$755,000
Demo Total	$5,559,000	$830,000	-$5,411,000	$5,791,000

3.0 Cost Model Update

3.1 INTRODUCTION

Black & Veatch understands that NCPA would like to utilize Black & Veatch's Cost Model at a future point in time without the need to fully re-perform the cost estimation exercise. Black & Veatch believes that the estimated amounts as shown in the Cost Model should remain materially accurate for a period of five to seven years, subject to adjustment for inflation. In order to allow the Cost Model to refresh the cost estimates as needed in the future, Black & Veatch has developed an escalation tool to estimate the future value of the cost estimates.

3.2 METHODOLOGY

Black & Veatch has built an escalation mechanism to adjust the 2016 Cost Model estimates to a desired future year using the U.S. Bureau of Labor Statistics (BLS) Producer Price Index (PPI). PPI measures the average change over time in the selling prices received by domestic producers for their output, and is reported on a monthly basis by the BLS for hundreds of categories of domestic producers. In order to allow for the update of the Cost Model, Black & Veatch has selected the four indices shown below in Table 3-1.

Table 3-1 Summary of PPI Assumptions

COST MODEL ITEM	PPI	SERIES ID
Indirect Costs	Engineering Services	PCU54133-5413
Direct Costs	Municipal utility and power generation and distribution engineering projects	PCU541330541330202
Construction Equipment	Construction equipment rental and leasing	PCU5324125324121
Scrap Value	Carbon Steel Scrap	PCU42993042993011

Black & Veatch has built two optional methods for updating the Cost Model using the above PPI, as summarized below:

- **Extrapolation:** The historical average annual percent change for an index (adjusted to exclude outlier years) is assumed to reasonably represent escalation for that cost category over the near term future, and the cost category is escalated at a fixed annual growth rate from the base year to the escalation year. The annual average was adjusted to omit any outlier years, defined as years in which the year-over-year growth fell outside of two standard deviations from the mean (excluding the 5 percent most extreme data).
- **Actual Value:** Because PPI is reported as an absolute index value and not a relative percentage growth rate, if a PPA values is known for both the base year and the escalation year, a cost category may be escalated proportional to the ratio of the escalation year's PPI value to the base year's PPI value. Black & Veatch has documented the latest September 2016 PPI value for each cost category, than may be compared to the actual future PPI value when the Cost Model is refreshed to reflect actual escalation.

The rationale for choosing each PPI, as well as the resulting fixed annual growth rate, is discussed in the following subsections.

3.2.1 Direct Costs

Black & Veatch has chosen the PPI "Municipal utility and power generation and distribution engineering projects" to represent escalation for estimated Direct Costs. Per the Cost Model methodology, Direct Costs are calculated as the value of contract or subcontracted labor and consumables to be utilized on the Project site. The chosen PPI reports the blended value of both services and goods typically required to construct utility or municipality scale power projects, which should utilize materially similar resources to the studied decommission scope.

The Municipal utility and power generation and distribution engineering projects index is a relatively new PPI, which has only been reported by the BLS since 2009. However, it has historically shown relatively consistent annual growth. A summary of this PPI, including actual annual percentage growth, average annual percentage growth, and adjusted annual average percentage growth is shown in Figure 3-1 below.

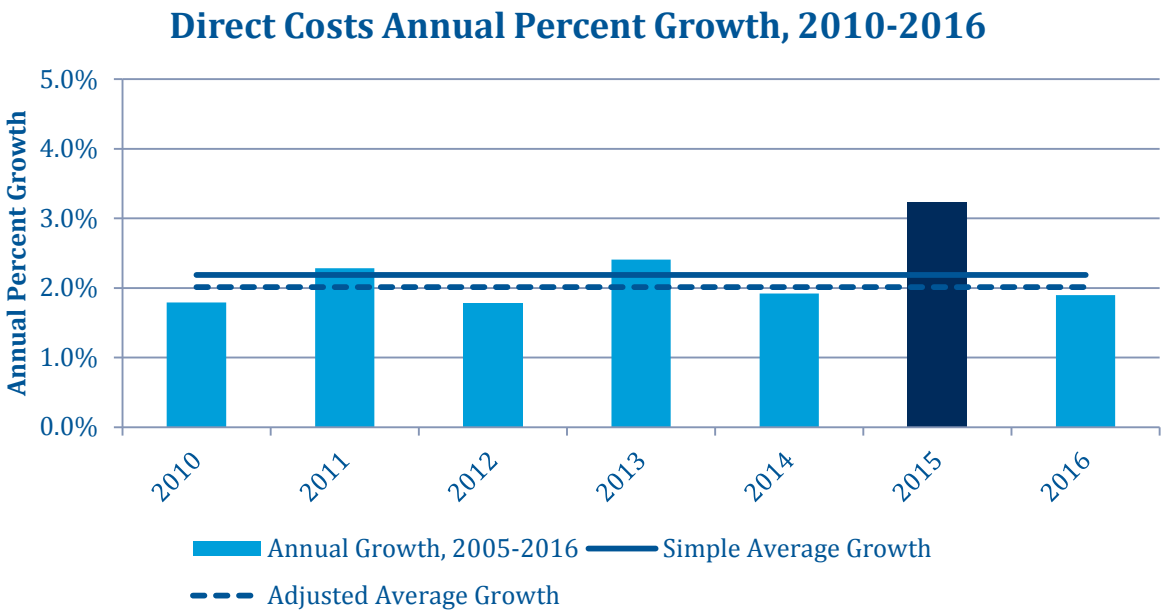

Figure 3-1 Direct Costs Annual Percent Growth, 2010-2016

As shown in Figure 3-1, Black & Veatch has calculated a simple historical average annual growth rate of 2.2 percent and an adjusted average annual growth rate of 2.0 percent when 2010 is omitted.

3.2.2 Indirect Costs

Black & Veatch has chosen the PPI "Engineering Services" to represent escalation for estimated Indirect Costs. Per the Cost Model methodology, Indirect Costs are calculated as the value of offsite labor, predominately engineering and project management. The chosen PPI reports the value of diversified engineering services.

The Engineering Services index has been reported by the BLS since 2004. A summary of this PPI, including actual annual percentage growth, average annual percentage growth, and adjusted annual average percentage growth is shown in Figure 3-2 below.

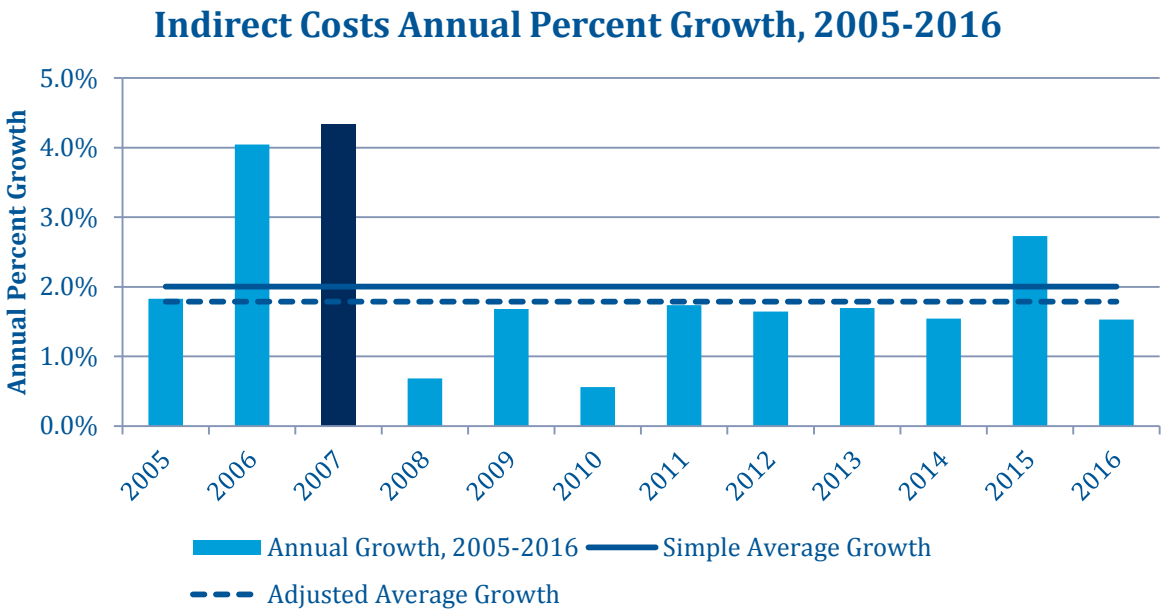

Figure 3-2 Indirect Costs Annual Percent Growth, 2005-2016

As shown in Figure 3-2, Black & Veatch has calculated a simple historical average annual growth rate of 2.0 percent and an adjusted average annual growth rate of 1.8 percent when 2007 is omitted.

3.2.3 Construction Equipment

Black & Veatch has chosen the PPI "Construction equipment rental and leasing" to represent escalation for estimated Construction Equipment Costs. Per the Cost Model methodology, Construction Equipment Costs are calculated as the value of the non-consumables equipment that is required to execute the demolition scope. The chosen PPI reports the value of construction equipment rental. Black & Veatch notes that the contractor performing the decommissioning work may choose to utilize owned equipment instead of rental; however, while the absolute value of renting versus owing equipment will vary, the overall market value trends should be linked and for relative annual growth assumptions, the chosen PPI should be applicable to both scenarios.

The Construction equipment rental and leasing index has been reported by the BLS since 2004. A summary of this PPI, including actual annual percentage growth, average annual percentage growth, and adjusted annual average percentage growth is shown in Figure 3-3 below.

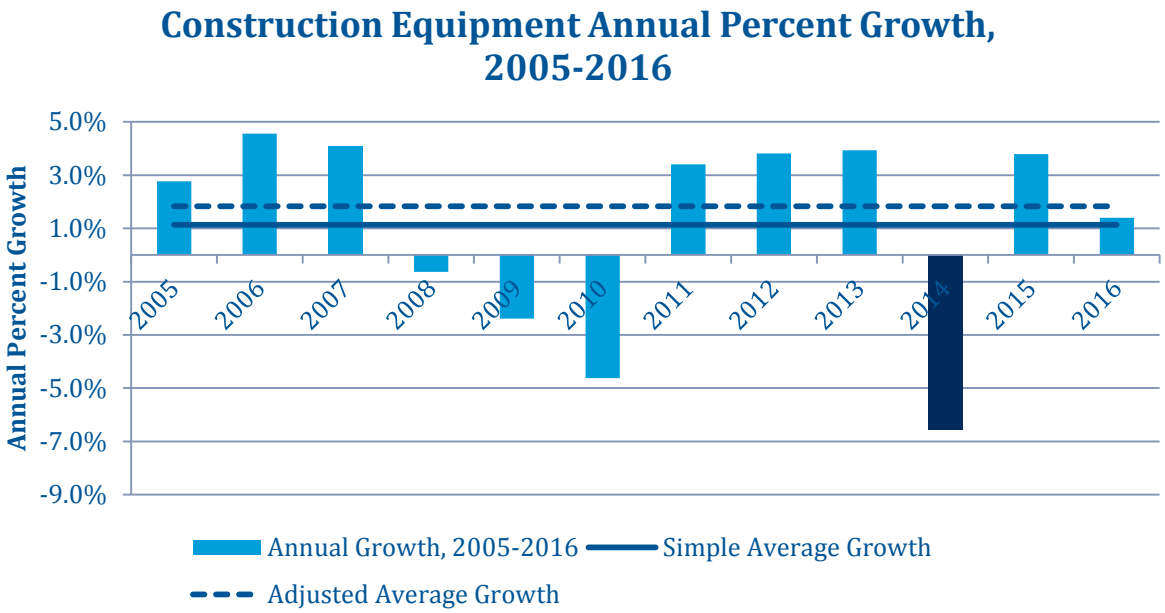

Figure 3-3 Construction Equipment Annual Percent Growth, 2005-2016

As shown in Figure 3-3, Black & Veatch has calculated a simple historical average annual growth rate of 1.1 percent and an adjusted average annual growth rate of 1.8 percent when 2014 is omitted.

3.2.4 Scrap Value

Black & Veatch has chosen the PPI "Carbon Steel Scrap" to represent escalation for estimated salvage value of materials recovered from the Project site. The chosen PPI reflects the value of high quality steel like that which is typically utilized in construction for the utility industry. Black & Veatch notes that other materials such as copper and precious metals will contribute to the actual salvage value of the Project; however, steel should represent the largest portion of salvageable material by value, and has accordingly been chosen as the representative index.

The Carbon Scrap Steel index has been reported by the BLS since 1987. A summary of this PPI, including actual annual percentage growth, average annual percentage growth, and adjusted annual average percentage growth is shown in Figure 3-4 below.

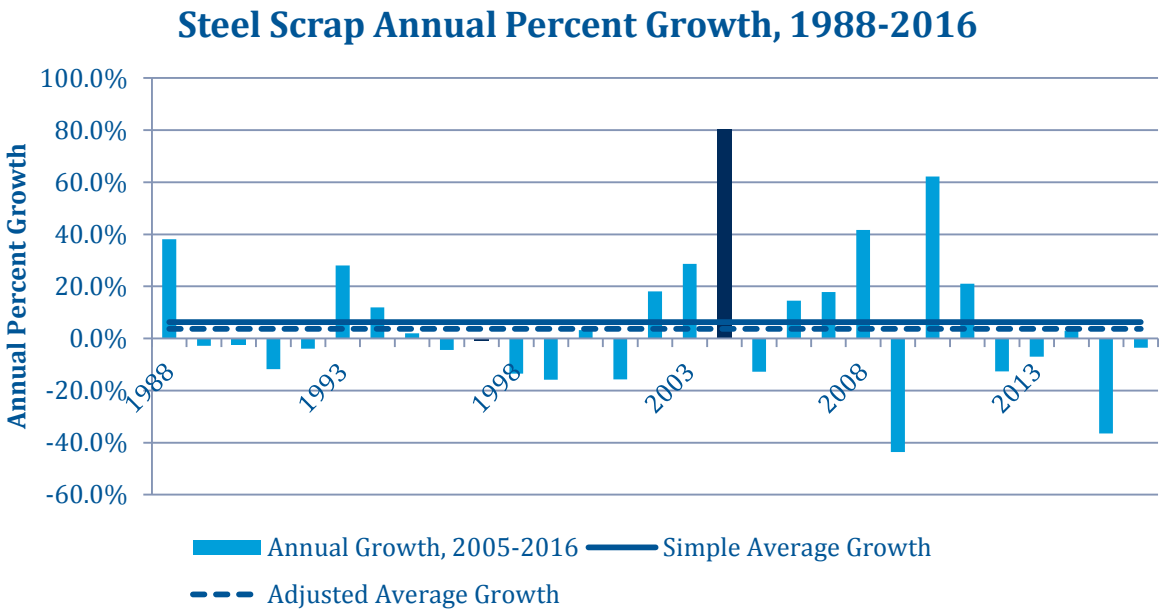

Figure 3-4 Steel Scrap Annual Percent Growth, 1988-2016

As shown in Figure 3-4, Black & Veatch has calculated a simple historical average annual growth rate of 6.3 percent and an adjusted average annual growth rate of 3.7 percent when 2004 is omitted.

Table 3-2 summarizes the estimated decommissioning and demolition costs for the project considering the future. For this example, the information in this table is based on 2016 as the Base Year, 2020 as the Escalation Year utilization of the Extrapolation Escalation Methodology.

Table 3-2 Decommissioning and Demolition Indexed Capital Cost Estimate Summary

COST ESTIMATE	2016 INDEX	2020 INDEX	2016 VALUE	2020 VALUE
Direct Costs	116.4	130.0	$6,389,000	$6,912,000
Less Salvage Value	297.5	300.0	-$5,411,000	-$6,254,000
Indirect Costs	128.7	130.0	$2,390,000	$2,565,000
Construction Equipment	115.4	130.0	$1,112,000	$1,195,000
Engineering & Construction Management	10% of Direct Labor		$556,000	$602,000
Contingency	15% of Subtotal		$755,000	$753,000
Total Cost	--		$5,791,000	$5,773,000

The information in this table is based on 2016 as the Base Year, 2020 as the Escalation Year using Extrapolation Escalation Methodology.

Appendix A. System Grouping


Lodi - CT1
Group 1
Group 2
Group 4
Group 2
Group 3
Group 2
Google earth
Image Landsat
N
100 ft