HISTORY OF THE SOUTHEAST RESOURCE RECOVERY PROJECT

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ABSTRACT

Development of the Southeast Resource Recovery Facility (SERRF), part of the City of Long Beach's integrated solid waste management program, began in 1978. SERRF was built using a bid procurement and turn-key concept. Financing was also bid instead of negotiated. SERRF has the support of local citizens and environmental groups.

This paper traces the development of the SERRF element of the City's total solid waste management program. Particular emphasis is placed on the involvement of the citizens with project planning, the procurement approach and lessons learned that are applicable in other settings.

INTRODUCTION

The Southeast Resource Recovery Facility (SERRF) is a part of the City of Long Beach, California integrated solid waste management program, itself a part of the Los Angeles County Solid Waste Management Plan.

The City is responsible for single family and small multi-family unit waste collections using its own forces. Commercial and larger multi-family unit collections are handled by franchised private haulers. The City also collects waste from its parks, streets, harbor and beaches. As another part of the City's integrated solid waste management program, a recycling program for residential and commercial wastes is being developed and implemented.

SERRF is the disposal point for all City collected solid wastes, as well as the waste delivered under contracts with the Cities of Lakewood and Signal Hill and several private haulers. SERRF is a waste-to-energy facility processing, on an annual average, approximately 1170 tons per day (TPD) of waste and generating approximately 30 MW of electricity for sale to Southern California Edison. Ash is currently disposed in the Los Angeles County Sanitation Districts' Puente Hills Landfill since the City of Long Beach has no landfill of its own. SERRF can also function as an incineration facility (no electrical generation) or as a transfer station (no waste combustion or electrical generation) to ensure that it is a reliable waste disposal location. SERRF also has provision for the addition of a front-end materials separation facility at some future date compatible with the growth in the waste stream and the performance of the community-based recycling program.

HISTORY

The origins of SERRF stem from the California Solid Waste Management and Resource Recovery Act

of 1972, which required the preparation of county solid waste management plans throughout the State. The Los Angeles County Solid Waste Management Plan, approved in December 1977, identified an impending crisis of disposal facilities in Southern Los Angeles County (Long Beach area), since the Anscon and Palos Verdes landfills would close in 1980.

With this warning, the County Sanitation Districts of Los Angeles County [CSD] and the City of Long Beach [City] prepared proposals for a feasibility study to be funded by California SB 1385 and SB 1855 and USEPA under the President's Urban Policy. The resulting preliminary study identified potential markets, sites and waste-shed, and recommended a more detailed study. Further study, completed in December 1978, identified the electricity sales market.

The two local landfills identified in the County Plan subsequently closed in 1980. The City had to adjust its disposal arrangements to deliver approximately half the waste it collected to a private transfer station and haul the remainder directly to the County Landfill at Puente Hills (a distance of about 30 miles). The result caused not only a change in organization and equipment, but also a major increase in the cost of City waste service.

A study was started in 1980 to develop a long-term solid waste management strategy for Long Beach to: minimize and contain solid waste disposal costs; promote community recycling and conservation goals; and reduce dependence on landfills. In starting the review and development of the resource recovery alternatives, the City and the County Sanitation Districts formed the Citizen's Advisory Committee [Committee] in December, 1980. This Committee was the avenue of communications among the SERRF Project and private citizens, business groups and environmental organizations.

The team performing the study met with the Citizen's Advisory Committee approximately monthly throughout the first year, and media and speakers programs were active during the initial Project Feasibility Study through mid-1981. The Committee commented on issues such as siting, recycling, choice of technology, air pollution and mitigation efforts, markets for electricity and steam, financing, traffic, and public participation. The Feasibility Report was unanimously supported by the Committee.

As a result of the cooperative effort, the study identified SERRF as a cost-effective, feasible and environmentally sound program coupled with recycling and waste reduction.

The siting discussion resulted in selection of a location in the City in the heavy industrial area of Terminal Island. There are no commercial businesses or residences in the immediate vicinity. Neighbors are the U.S. Navy, the ports of Los Angeles and Long Beach, a Southern California Edison [SCE] generating station, and oil production and refining areas. While the site had these obvious advantages of location, it had construction disadvantages in that Terminal Island is a man-made island over an active oil field with a water table 3–4 ft below ground level. The Committee and project management did not have significant differences on the siting decision.

Initially, SERRF was proposed as a refuse derived fuel processing facility, recovering glass, ferrous metals and aluminum, equipped with spreader stoker furnaces and water wall boilers. The facility would produce steam for the Long Beach Naval Shipyard and electricity for Southern California Edison under a 20 year contract based on SEC's avoided cost. Air pollution control would use Best Available Control Technology [BACT]; NO_x control by combustion modification and ammonia injection, spray dryers for acid gas control and baghouses for particulate control. The proposed financing was to be by revenue bonds issued by a public entity; utilizing procurement by a conventional architect/engineer approach. As initially conceived, the project schedule provided for start of work in 1981 and operation by the end of 1985.

The Committee served as the coordinating body for the public workshop seminar cosponsored by the League of Women Voters and the Sierra Club in May 1981. Expanded news coverage accompanied the draft Environmental Impact Report issued for the 45 day review and comment period in May and the Environmental Impact Report public hearing in June 1981. The Committee unanimously supported the Environmental Impact Report.

The final Environmental Impact Report was published in November 1981. Preliminary specifications for the facility were prepared and the Citizen's Advisory Committee agreed to continue their advisory role as the project proceeded.

In 1982, the project was reevaluated in the light of reduced energy prices and unexpected high costs of construction. This reevaluation resulted in the project which was implemented.

The Citizen's Advisory Committee continued its involvement through this review and restructuring of the project. There was a peak in media coverage during November 1983 at the public hearing before the Long Beach Planning Commission. The Commission heard testimony and determined that the facility conformed to and was consistent with the Long Beach General Plan.

PERMIT	DATE
Environmental Impact Report County Sanitation Districts of Los Angeles County	5/81
Consistency with General Plan: City of Long Beach Planning Commission City of Long Beach City Council	11/10/83 12/6/83
Air Permit to Construct South Coast Air Quality Management District	7/9/84
Notice of Determination: No significant adverse environmental impacts City of Long Beach Planning Commission	10/18/84
Outfall Permit U.S. Army Corps of Engineers	3/28/85
Solid Waste Facility Permit California Solid Waste Management Board	5/29/85
Harbor Development Permit City of Long Beach Harbor Department	6/24/85
National Pollutant Discharge Elimination System [NPDES] Permit California Regional Water Quality Control Board	10/23/85
Prevention of Significant Deterioration [PSD] Permit U.S. Environmental Protection Agency	10/23/85

FIG. 1 LIST OF MAJOR PERMITS

AIR PERMIT EMISSION LIMITS

NSR

- PARTICULATES – 5 lb/hr/unit (2.27 kg/hr unit)
- OXIDES OF NITROGEN – 150 ppmdv @ 3% O_2
  – 36 lb/hr/unit (16.33 kg/hr unit)
- OXIDES OF SULFUR – 35 ppmdv @ 3% O_2
  – 12 lb/hr/unit (5.44 kg/hr unit)
- CARBON MONOXIDE – 33 lb/hr/unit (14.97 kg/hr unit)
- ORGANIC GASES – 1 lb/hr/unit (0.45 kg/hr unit)
- HYDROGEN CHLORIDE – 8.5 lb/hr/unit (3.86 kg/hr unit)

PSD

- OXIDES OF SULFUR – 30 ppmdv @ 12% CO_2 (3 hr. avg.)
  – 17 lb/hr/unit (3 hr. avg.) (7.71 kg/hr unit)
  – 26 ppmdv @ 12% CO_2 (8 hr. avg.)
  – 12 lb/hr/unit (8 hr. avg.) (5.44 kg/hr unit)
  – CEM Compliance Tool
- LEAD – 0.08 lb/hr/unit (3 hr. avg.) (0.04 kg/hr unit)
- MERCURY – 0.12 lb/hr/unit (3 hr. avg.) (0.54 kg/hr unit)
- HYDROGEN FLUORIDE – 1.1 lb/hr/unit (3 hr. avg.) (0.49 kg/hr unit)

WATER PERMIT EMISSION LIMITS

NPDES

- COPPER – 4 ug/l (24 hr. avg.)
- ZINC – 58 ug/l (24 hr. avg.)
- OIL & GREASE – 10 mg/l (30 day avg.)
- BOD_5 20°C – 20 mg/l (30 day avg.)

OUTFALL

- SECTION 330.5(a)(7)--Federal Register

SOLID WASTE FACILITY PERMIT REQUIREMENTS

- MUNICIPAL AND COMMERCIAL WASTE ONLY
- INSPECT AND SEPARATE HAZARDOUS WASTE
- NO BLOWING DEBRIS
- SAFETY PLAN BY CERTIFIED INDUSTRIAL HYGIENIST

ADDITIONAL DESIGN REQUIREMENTS

- UNIFORM BUILDING CODE (Earthquake Zone 4)
- UNIFORM FIRE CODE 1982
- UNIFORM PLUMBING CODE 1982
- NATIONAL ELECTRIC CODE 1984
- NATIONAL FIRE PROTECTION ASSOCIATION 1982
- HARBOR DEVELOPMENT PERMIT (6/24/85) (chemical safety and aesthetics)

FIG. 2 SUMMARY OF MAJOR PERMIT REQUIREMENTS

The business approach of using a public entity that became the SERRF Authority to finance and own the facility remained. However, it was decided that procurement by the City, as agent for the SERRF Authority, would be through the use of a competitive bid process and turn-key method (design, build, demonstrate). This bid approach required that the major permits (see Fig. 1) be in place before bids were solicited and detailed design could begin. There was major media coverage associated with the 30 day review period and the hearing before the South Coast Air Quality Management District for the Permit to Construct in July 1984. In October 1984, the project was again considered by the Long Beach Planning Commission through a public review, public hearing and certification of a Negative Declaration for SERRF pursuant to the California Environmental Quality Act.

The SERRF Authority (the owning public agency formed by the City of Long Beach and the County Sanitation Districts of Los Angeles County) was formed in 1984. The site on Terminal Island was secured by the City of Long Beach in the same year. The Energy Sales Agreement with Southern California Edison was concluded in November 1984 and the Press Conference announcing the contract was held in December 1984.

The payoff for the efforts of the Citizen's Advisory Committee came with statements of support from the Sierra Club (Angeles Chapter), Long Beach Chapter of the League of Women Voters and the Alamitos Bay Beach Preservation Association. In addition, the East Side Joint Council of Home Owners (consortia of local improvement and homeowners associations) gave their blessings to SERRF.

Specifications and the Invitation For Bids for sister contracts to Design, Construct and Demonstrate [DCD] and Operate [OPS] the facility were prepared early in 1985. A summary of major features of the permits and design codes is provided in Fig. 2 and Major Process Equipment Characteristics are summarized in Fig. 3. These requirements were incorporated into the bid document.

Bids were received in September 1985 and reviewed. The review process was formally declared and included combined financial analysis of the DCD and OPS Contract bids. This process included accounting for above-minimum specifications to arrive at the low responsive bidder for the two contracts combined and confirmed the bond sizing assumptions. Although the role of the Citizen's Advisory Committee was reduced from the more hectic days of project formulation, group and individual contributions and interest continued.

Financing by competitive bid sale of lease revenue

2	REFUSE CRANES	P&H HARNESHFEGER 11 (10,000 kg) tons capacity
2	ORANGE PEEL GRAPPLES	HAWCO 8 cubic yard (6 m^3) capacity
3	INCINERATOR/BOILERS	L&C STEINMULLER, GMBH MAXIMUM CONTINUOUS RATING 117,170 lb/hr (53,150 kg/h) at 650 psig/750°F with 329°F (165°C) Feedwater; 2 HOUR PEAK 125,000 lb/hr (56,700 kg/h) at 650 psig/750°F; DESIGNED FOR 65% EXCESS AIR WITH 10% FLUE GAS RECIRCULATION AND 85% EXCESS AIR WITHOUT FLUE GAS RECIRCULATION; SUPER HEATER T-11 STEEL, RAPPER CLEANING; BOILER SECTION A-34 STEEL, RAPPER CLEANING; ECONOMIZER A-34 STEEL, RAPPER CLEANING; 428°F (220°C) CLEAN BOILER, 500°F (260°C) MAXIMUM FOULING AT ECONOMIZER OUTLET
3	DRY SCRUBBERS	FLAKT/PEABODY PROCESS SYSTEMS ROTARY ATOMIZER SLAKED LIME 1.6 stoichiometric ratio
1	BAGHOUSE	FLAKT/PEABODY PROCESS SYSTEMS 30 MODULES 2 parallel trains of 5 modules per boiler with internal cross-over; 168 BAGS PER MODULE with 8" diameter, 227" long (0.02m x 5.76m) FABRIC: Fiberglas with 10% TeflonB AIR-TO-CLOTH: 2:1; 1:1.82 with 2 modules off-line per train
1	STACK	CONTINENTAL-HEINE 3 FLUES A-36 STEEL; 265 feet (81m) tall
1	STEAM TURBINE	IMO - DELAVAL SHAFT POWER: 37,504 kW THROTTLE CONDITION: 600 psia, 750°F (41.4 bars, 400°C) SPEED: 3600 RPM DESIGN EXHAUST: 2 in Hg Absolute (0.07 hrs) EXTRACTIONS @ 105, 20, 7.7, 0.98 psia (7.2, 1.4, 0.53, 0.07 bars)
1	GENERATOR	ALSTHOM RATING: 43,446 kVA, Air Cooled
1	PLANT CONTROL	WESTINGHOUSE DISTRIBUTED CONTROL SYSTEM plus individual programmable controllers on all major systems
1	COOLING TOWER	HAMON INDUCED DRAPT 3 CELL
2	BOILER WATER TREATMENT	AQUATECH REVERSE OSMOSIS - 50 gpm (11.3 m^3/h) per unit normal; 70 gpm (15.9 m^3/h) per unit maximum
1	ASH SYSTEM	DRAVO WELLMAN BOTTOM ASH: VIBRATORY CONVEYORS (GENERAL KINEMATICS) TO BELT CONVEYORS DRY SCRUBBER: BOX DRAG CHAIN CONVEYORS BAGHOUSE: ENCLOSED SCREW CONVEYORS
2	FLY ASH CONDITIONERS	DRAVO WELLMAN MODEL DM03; 2.79 TPH (2,700 kg/h)
3	FLUE GAS RECIRCULATION FANS	L&C STEINMULLER, GMBH
3	SELECTIVE NON-CATALYTIC (NOx) REDUCTION	EXXON - THERMAL De NOx PROCESS LICENSE ENERGY SYSTEMS ASSOCIATES - DESIGN
1	COOLING TOWER WATER TREATMENT SYSTEM	DREW 12 cycles of concentration
1	ZERO DISCHARGE SYSTEM	FLAKT/PEABODY PROCESS SYSTEMS COLD LIME SOFTENED COOLING TOWER BLOWDOWN TO DRY SCRUBBER
2	LIME SLAKERS	WALLACE TIERNAN 1 ton per hour (977 kg/h)
2	TRUCK SCALES	STREETER RICHARDSON 10 feet x 60 feet, (3m x 18.3m) 60 tons capacity (54,446 kg)
1	CONTINUOUS EMISSIONS MONITORING SYSTEM	KVB, INC.

POLLUTANT	STACK MONITOR	PROCESS CONTROL
HCl	- BODENSEEWERK	- THERMO ELECTRON #53
NOx	- THERMO ELECTRON #10AR	- THERMO ELECTRON #10AR
OPACITY	- THERMO ELECTRON #M-400	- NONE
CO & CO_2	- ACS (FUJI) #3400	- ACS(FUJI) #3400
SOx	- WESTERN RESEARCH #721-2, A	- WESTERN RESEARCH #721-2, A
NH_3	- NONE	- TWIN DIFFERENTIAL
O_2	- THERMOX MODEL III	- YOKAGAWA 2021

FIG. 3 MAJOR PROCESS EQUIPMENT CHARACTERISTICS

bonds valued at $125 million was completed in December 1985. The bond issue was purchased at a net interest cost of 8.999% including underwriters discount by a syndicate headed by Merrill Lynch/Bank of America. The bonds were issued with a Provisional "A" rating by Standard and Poors, and a Conditional "A" rating by Moody's. This, together with a $12 million trust fund established by the City, enabled the DCD and OPS Contracts to be awarded to Dravo Corporation in December 1985. The Citizen's Advisory Committee expressed continued support for the project at the ground breaking ceremony in February 1986.

A second bond issue with the same ratings, valued at $19.5 million, was sold by competitive bid to Paine Webber at a net interest cost of 7.815% including underwriters discount of 1.99% in August 1986. This allowed all but $764,000 of the trust fund established in connection with the 1985 bond issue to be returned to the City.

In December 1986, supplies of municipal solid waste were sufficient to justify the third stage of the facility. Consequently, the option in the construction and operation contracts for expansion to 1150 tons per day was exercised in December 1986. The expansion was financed with $25 million worth of bonds.

With efforts commencing in January 1986, the facility was designed and constructed and the first solid waste was burned by July 1988. An initial three month Performance Demonstration was carried out during September, October and November of 1988. The facility was found deficient, for reasons including failure to achieve guaranteed levels of electrical production for sale to SCE, air permit violations and premature damage to the waste storage area walls. The contractually-allowed 12 month repair period began December 8, 1988.

On November 29, 1988, the Contract to Operate was assigned to Montenay Pacific Power Corporation at the request of Dravo Corporation. Montenay operated SERRF as a subcontractor to Dravo until September 20, 1989.

A second Performance Demonstration was completed in September 1989 and the facility was again rejected for cause. Deficiencies included a continuing failure to meet guaranteed electrical production levels and other defects, which are estimated to cost about $8 million to remedy. The City and Dravo are in litigation over the Design, Construct and Demonstrate Contract.

The City has taken over the facility to remedy the work improperly executed by Dravo. The City has also activated the Operating Contract beginning September

20, 1989 with Montenay and has agreed to pay Montenay to carry out the repair work.

IN REVIEW

One may speculate on what might have happened if things had been done differently. For certain, without the City's determination to take a leadership position in solid waste management, the City government and citizens would be facing a solid waste disposal crisis. However, there is a strong feeling that without the public participation program, there would have been no project.

The Citizen's Advisory Committee is deservedly congratulated on their persistence and stamina in serving the project formulation process conscientiously over a period which lasted more than three years, and has continued throughout construction of the SERRF Project into the recycling program.

Public concerns, expressed by the Citizen's Advisory Committee, included the effects on the environment. For example, analysis of the project included consideration of dioxins and incinerator ash before these issues achieved national prominence. Analysis of available data applied to the SERRF Project allowed estimates of environmental impacts as required for the Environmental Impact Reports and permit submittals. Perhaps more importantly, the evaluation of the existing situation and other alternatives included the impact of road transportation (such as air pollution and traffic accidents). This evaluation indicated that the SERRF Project has an acceptable and lower environmental impact as compared to the alternative of continued disposal at a landfill.

The fundamental issue that the Citizen's Advisory Committee really addressed is the management of solid waste. Solid waste is an inevitable by-product of society. Local government in our urban societies is responsible for safe, reliable and economical solid waste disposal. The Committee interpreted the responsibility to include a long-term solution which minimized export of waste to other neighborhoods and communities even though continued local landfill disposal is a viable option.

Procurement requirements determined that the facility would be obtained using a bid (rather than proposal) process. To maintain single source responsibility for design and operation of the facility, sister DCD and OPS Contracts were used, which was unique in the waste-to-energy field. By correctly allocating the risks among the parties, this approach has worked. This facility is operating legally and is financially self-sustaining in an environment of competitive tipping fees.

A criterion for the development of the project was that it should be financially self-sustaining. This required the use of a project financial model. This enabled development concepts, value engineering suggestions and change order requests and changes in law to be promptly evaluated and the benefit to the owner—the citizens of Long Beach—maintained intact.

CONCLUSION

In summary, waste burning at the SERRF Plant reduces the volume to be landfilled by about 80–90%. Long Beach does not have any landfills and SERRF has thus minimized dependence on outside landfills. The combination of reduction in material sent to landfill and revenue from electricity sales reduce the cost to the City for waste disposal—and the cost to the citizens. Protection against rapidly rising waste disposal costs is gained by a continued commitment by the citizens of Long Beach to process their waste through SERRF, to source reduction and to recycling.

Key Words: Case Study; Integrated System; Long Beach, California; Procurement; Project Development; Turnkey