

Solution.

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- ① Boiler (1.2) and Boiler Support System (1.3);
cost of 1993 boiler and support system = \$110 million.
Cost index for boilers in 1993 = 110

Cost index for boilers in 2016 = 492

Cost Capacity factor = 0.9.

∴ Estimated Cost in 2016;

From: $C_{2016} = C_{1993} \left(\frac{I_{2016}}{I_{1993}} \right) \times \text{Cost Capacity factor}$

$$= 110 \text{ million} \times \left(\frac{492}{110} \right) \times 0.9$$

$$= \$442.8 \text{ million}$$

Site (1.1)

- ② Land improvements (1.1.1);

$$= 600 \text{ acres} \times \$2,000 = \$1.2 \text{ million.}$$

Roads (1.1.2) = \$1.2 million.

Railroads (1.1.3) = \$8 million.

- ③ Support facilities and Equipment (1.5);

labour for support facilities and equipment (1.5.2)

$$= 95,000 \text{ hours} \times \$60 = \$5.7 \text{ million}$$

Materials for support facilities and equipment (1.5.3)

$$= \$15 \text{ million}$$

Total cost (excluding security systems): $$(5.7 + 15) \text{ million} = \20.7 million

Learning Curve factor = 90%

$$\text{Adjusted labour cost} = \$5.7 \text{ million} \times (1 - 0.9) = \$0.57 \text{ million}$$

$$\text{Total estimated cost} = $(20.7 + 0.57) \text{ million} = \$21.27 \text{ million.}$$

④ Security Systems (1.5.4)

Cost per acre = \$1,500

$$\text{Total Cost} = \$ (1500 \times 600) = \$ 0.9 \text{ million}$$

⑤ Coal Storage Facility (1.4)

Cost of 1993 coal storage facility: \$5 million

Cost index for boilers in 1993 = 110

Cost index for boilers in 2016 = 492.

 \therefore Estimated Cost in 2016 is,

$$= \$ 5 \text{ million} \times \left(\frac{492}{110} \right)$$

$$= \$ 22.3636 \text{ million}$$

⑥ Project integration (1.9);

Cost as percentage of all other Construction Costs = 3%

Total estimated Cost:

$$= \$ (442.8 + 1.2 + 1.2 + 3 + 21.27 + 0.9 + 22.3636) \text{ million}$$

$$= \$ 492.7336 \text{ million.}$$

$$\begin{aligned} \text{Project integration Cost} &= 3\% \times 492.7336 \text{ million} \\ &= 14.7820 \text{ million.} \end{aligned}$$

⑦ Total Estimated Cost.

$$\begin{array}{rcl} \text{Total estimated Cost} & \$ & 492.7336 \text{ million} \\ \text{Project integration Cost} & + & \$ 14.7820 \text{ million} \\ \hline & = & \$ 507.5156 \text{ million} \end{array}$$

Assumptions made;

- All costs are in 2016 dollars.
- Costs for the coal storage facility are proportional to the boiler costs.
- All costs are assumed to be proportional to the size of the 1993 plant compared to the plant being estimated.