

**Problem 4-13**

Analyze the basic economics and show an I/O diagram for producing hydrogen from water, coal, and natural gas. What production mode should be utilized to obtain production rates of  $3 \times 10^7$  and  $1 \times 10^8$  kg/yr?

Cost data:	Electricity:	\$ 0.05/kWh (Cost & Eval. Worksheet)
	H <sub>2</sub> :	\$ 4.67/kg (Google – average market price of hydrogen)
	O <sub>2</sub> :	\$ 0.04/kg (Kirk-Othmer)
	CO:	\$ 0.20/kg (Google – average market price of carbon monoxide)
	Bituminous:	\$ 0.108/kg (eia.gov, 8 February 2025)
	Anthracite:	\$ 0.171/kg (eia.gov, 8 February 2025)
	Generic Coal:	\$ 0.055/kg (Cost & Eval. worksheet)
	Steam:	\$ 0.008/kg (Cost & Eval. Worksheet)
	Natural gas:	\$ 1.344/kg (Henry Hub Spot, 3 February 2025)
	Natural Gas:	\$ 1.289/kg (Cost & Eval. Worksheet)