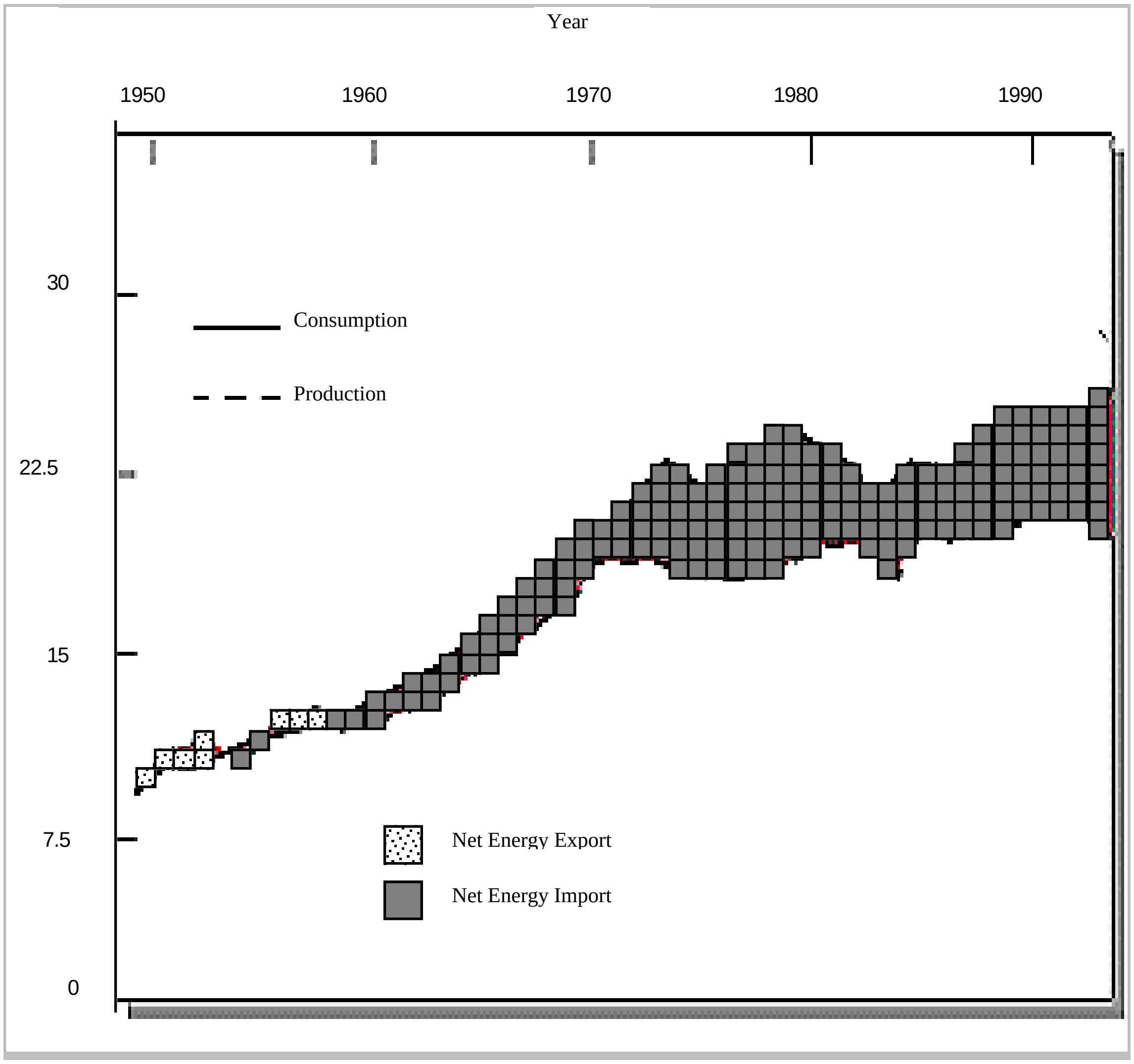
Solutions - US Energy Consumption and Production



The area enclosed between the two curves represents the energy consumed or produced. You can estimate this highly irregularly shaped area by approximating it with regularly shaped areas. In this case, we have covered the irregular shape with small rectangles.

- When the consumption curve is higher than the production curve, the US must import energy.

- When the production curve is higher than the consumption curve, the US may export energy.

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Energy Costs

Each rectangle on the diagram has an area of (MW stands for megawatt):

0.75 (billion MW per year) $\times$ 0.91 (years) = 0.6825 (billion MW).

Eight of the little rectangles correspond to exports of energy, so the total amount of energy exported was approximately:

8 $\times$ 0.6825 = 5.46 billion MW.

One hundred and eighty one of the little rectangles correspond to imports of energy, so the total amount of energy imported was approximately:

181 $\times$ 0.6825 = 123.53 billion MW.

To calculate the net cost of energy, we assume:

- $25 was paid for each megawatt imported, and,
- $25 was recieved for each megawatt exported.

The total costs of all energy imported from 1950-1995 was apporximately:

123.53 (billion MW) $\times$ 25 (dollars per MW) = 3088.25 billion dollars.

That's $3088250000000.00 or just over three trillion dollars. The total revenues from all energy exported from 1950-1995 was approximately:

5.46 (billion MW) $\times$ 25 (dollars per MW) = 136.5 billion dollars.

The net cost is the cost of the imports less the revenue recieved from imports, which is 2951.75 billion dollars.

Area Between Curves

The area enclosed between the two curves can be similarly estimated by approximating the irregularly-shaped areas with a set of regular shapes. From this you can form a Riemann sum, and take the limit to get a definite integral.

$$Area = \int_{-1}^{0} \left(f(x) - g(x) \right) dx + \int_{0}^{2} \left(g(x) - f(x) \right) dx$$