INCORPORATION OF EFFICIENCY IMPROVEMENTS IN ESTIMATE OF FUTURE ENERGY DEMAND

Implicit incorporation via energy prices

$ED=f(GDP, P) = A \cdot GDP^{a} \cdot P^{-b}$

$\ln ED = \ln A + a \ln GDP - b \ln P$

$a = (d \ln ED / d \ln GDP)_{P}$

= GDP Elasticity of ED

$-b = (d \ln ED / d \ln P)_{GDP}$

= b Price Elasticity of ED

PROBLEMS WITH ELASTICITIES

- Price elasticities can't cope with following problems:
  - How will future price increases affect ED and carrier substitution
  - What is the role of non-price-related measures
  - How will economy (e.g.recession) will affect ED

PROBLEMS WITH ELASTICITIES

- Elasticities are difficult to measure and vary a great deal
- Price elasticities overemphasize role of prices

  Any change not explained by GDP is ascribed to price including non-price-related measures

PROBLEMS WITH ELASTICITIES

- Elasticities are black boxes that don't explain how prices affect ED

  e.g. Price elasticity of household demand will integrate effect of prices on
  - level of ED
  - changes in existing EU equipment
  - choice of new equipment

(b) Explicit Incorporation of EI

If c = rate of EI,

then $ED = A \cdot GDP^a / (1+c)^n$

$ED(t) / ED(0) = [GDP(t)/GDP(0)]^a / (1+c)^n$

$(1+g_{ED})(1+c) = (1+g_{GDP})^a = 1+a\ g_{GDP}$

$a_{eff} = g_{ED}/g_{GDP} = a_{FE}\ (c/g_{GDP})/1+c$

$a_{FE} = a\ (c = 0)$

DOUBLE ELASTICITY MODEL

$$ED = A.\ GDP^a\ P^{-b} / (1+c)^n$$

P^{-b} = Price-induced efficiency improvement

$(1+c)^n$ = Non-price-induced efficiency improvement