UNIVERSITY OF PATRAS
DEPARTMENT OF ECONOMICS

ENERGY ECONOMICS

Academic Year 2022-2023
Winter Semester
Lecture 5th-6th
Pricing in energy markets

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Energy Economics

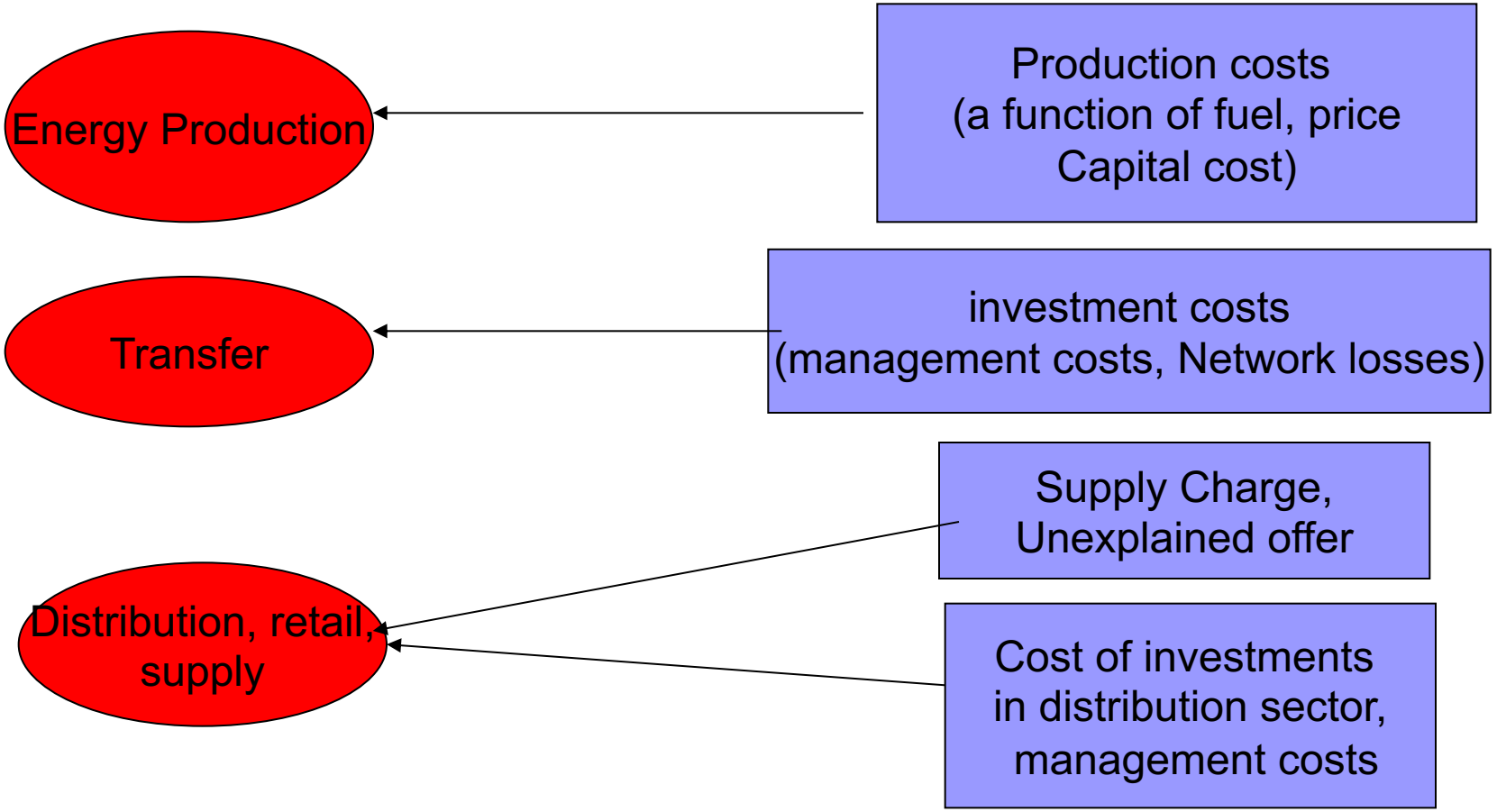
6th Lecture: Pricing

- Pricing in the energy sector is an important instrument of the country's overall energy policy and is used to meet different objectives, many of which are contradictory.
- On the other hand, domestic energy prices are partly determined by the operation and the influences of the international energy markets on the one hand and the socio-political environment of the country on the other.
- Moreover, since energy is an intermediate product and an end product, prices should be differentiated taking into account the distinction between producers and consumers.
- Additional criteria such as exhaustibility, capital intensiveness, and non-storability call attention to care on a case-by-case basis.
- Thus, pricing product energy is a complex and difficult task (Bhattacharyya 1996) or the results of a two-step procedure Munasinghe (1985).

Supply chain of electricity and determination of costs I

Energy supply includes a series of primary production or supply activities energy from local or external sources, transformation of primary energy sources into usable forms, the transfer of energy to large quantities and the distribution of energy to end consumers through retail activities selling. In addition, the retail price also includes the fees, duties, taxes or subsidies, as required by the State or its services. Consequently, the retail price is the final result of the combination of the various cost elements involved throughout the energy value chain.

Supply chain of electricity and determination of costs I



Two basic pricing models

- The principle of average cost uses the cost of production of a business, considering it does not incur huge losses or produces high profits.
- They do not provide sufficient clues to investors.
- It does not provide any incentive to improve performance and allows weaker businesses to coexist with better ones.
- It does not take into account the costs of increasing capacity

- P=MC (Pareto).
- Due to the specific features of the energy market, pricing of marginal costs based may not be appropriate (capital indiscriminate).
- Long-term pricing based on marginal cost (consumer billing).Beware of monopolies.

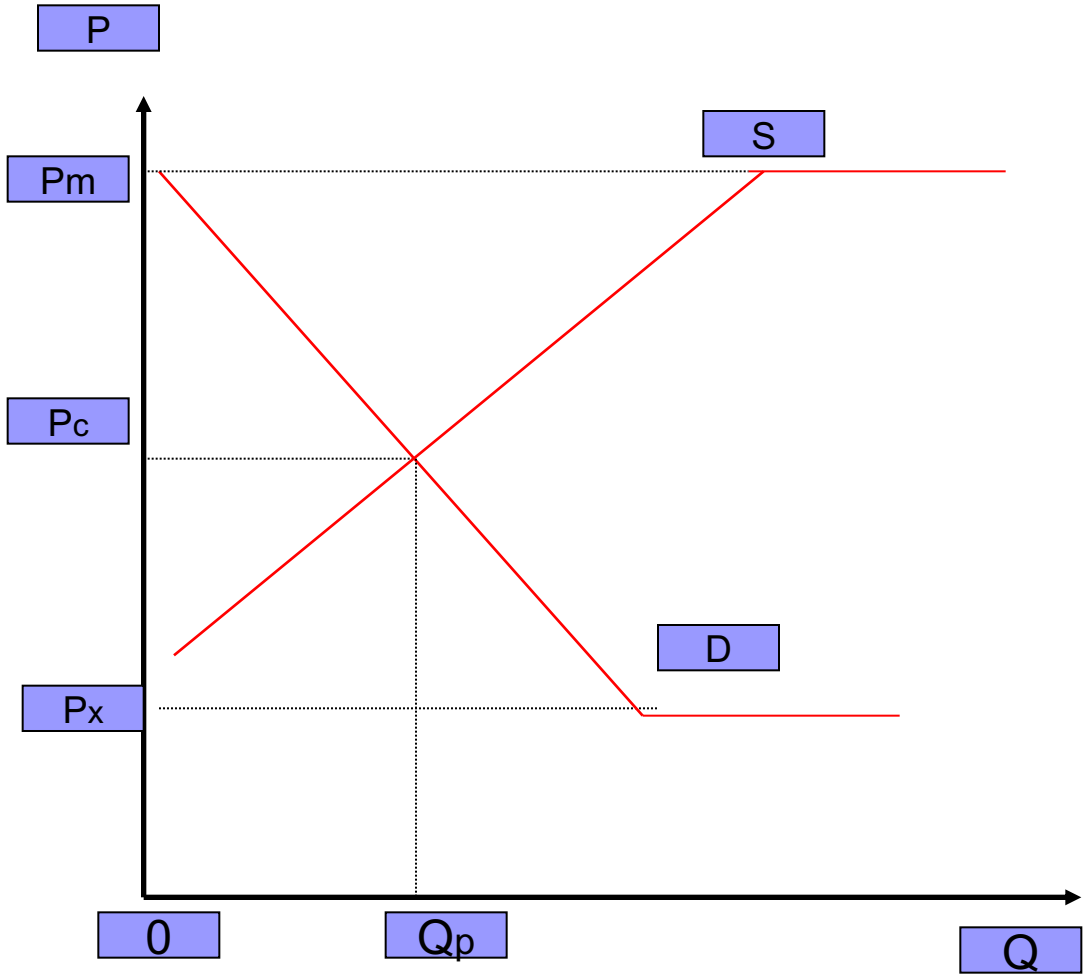
$$\frac{dAC}{dQ} = \frac{d\left(TC/Q\right)}{dQ} = \frac{Qd\left(TC/Q\right) - dTC}{Q^2} =$$

$$\frac{QMC - TC}{Q^2} = 0$$

Marketability and opportunity cost

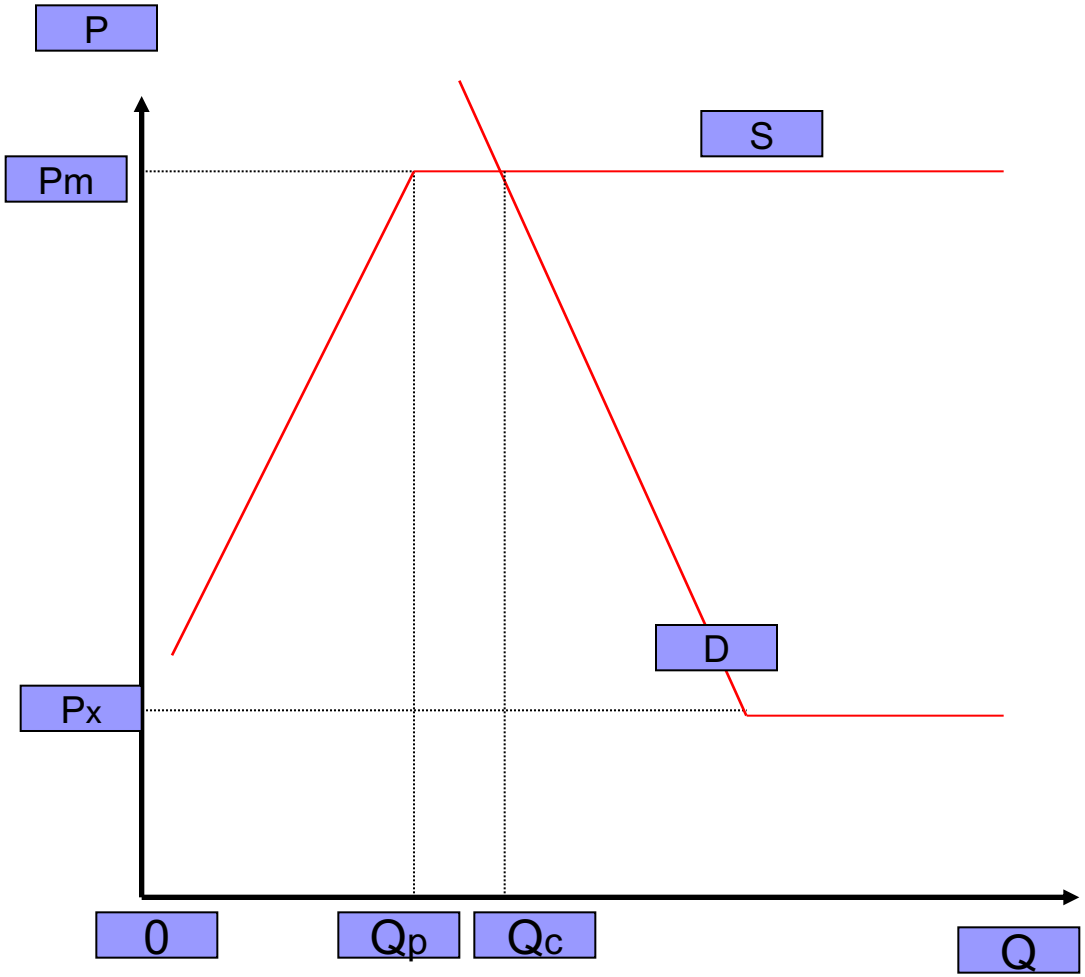
Energy products can be an object negotiation at international or regional level. Therefore, four specific cases may arise:
1) a self-sufficient country in energy,
2) a country that resorts to import, so that complete its offer,
3) A country exporting
4) an importing country without domestic resources.
The marketable nature of energy goods affects them supply and demand curves facing each of them above categories countries and affects their results prices (Rangaswamy, 1989).
Let's examine three of these cases.

A self-sufficient country in energy,



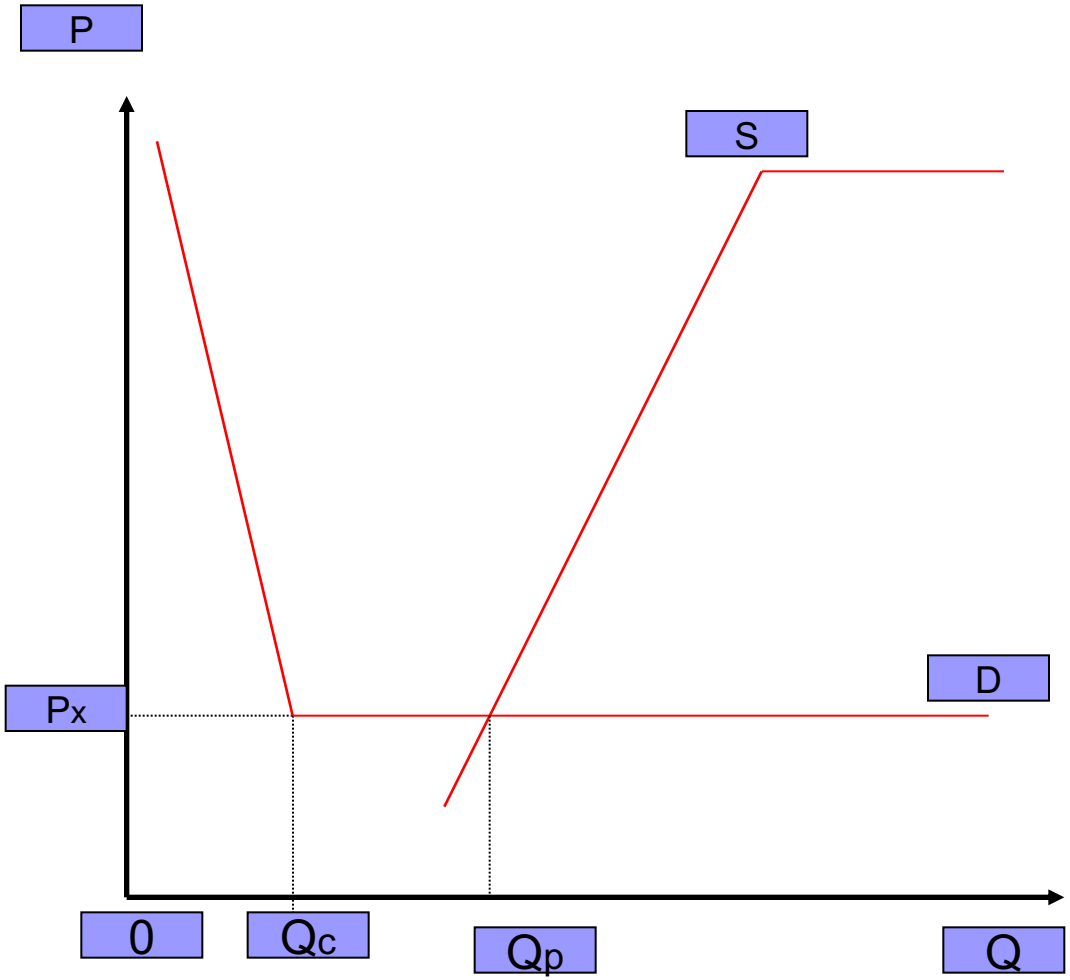
A small producer country faces a horizontal demand curve corresponding to an export price. It also faces a supply curve that contains a horizontal segment corresponding to the import parity. What about this case?

An importing country



What changes when our country is an importer?
Domestic production will be Qp and an amount equal to Qp-Qc will be entered.

An exporter country



For a clean exporter, the correct domestic price is the export value, px (why?). (Qp - Qc) for exports. Thus, for a commodity, the pricing rule needs to change from the beginning of the MC and consumers may face different energy prices, depending on their demand, the cost of domestic production, imports and exports. What is the role of transport costs and how it differentiates between gas, oil, etc?

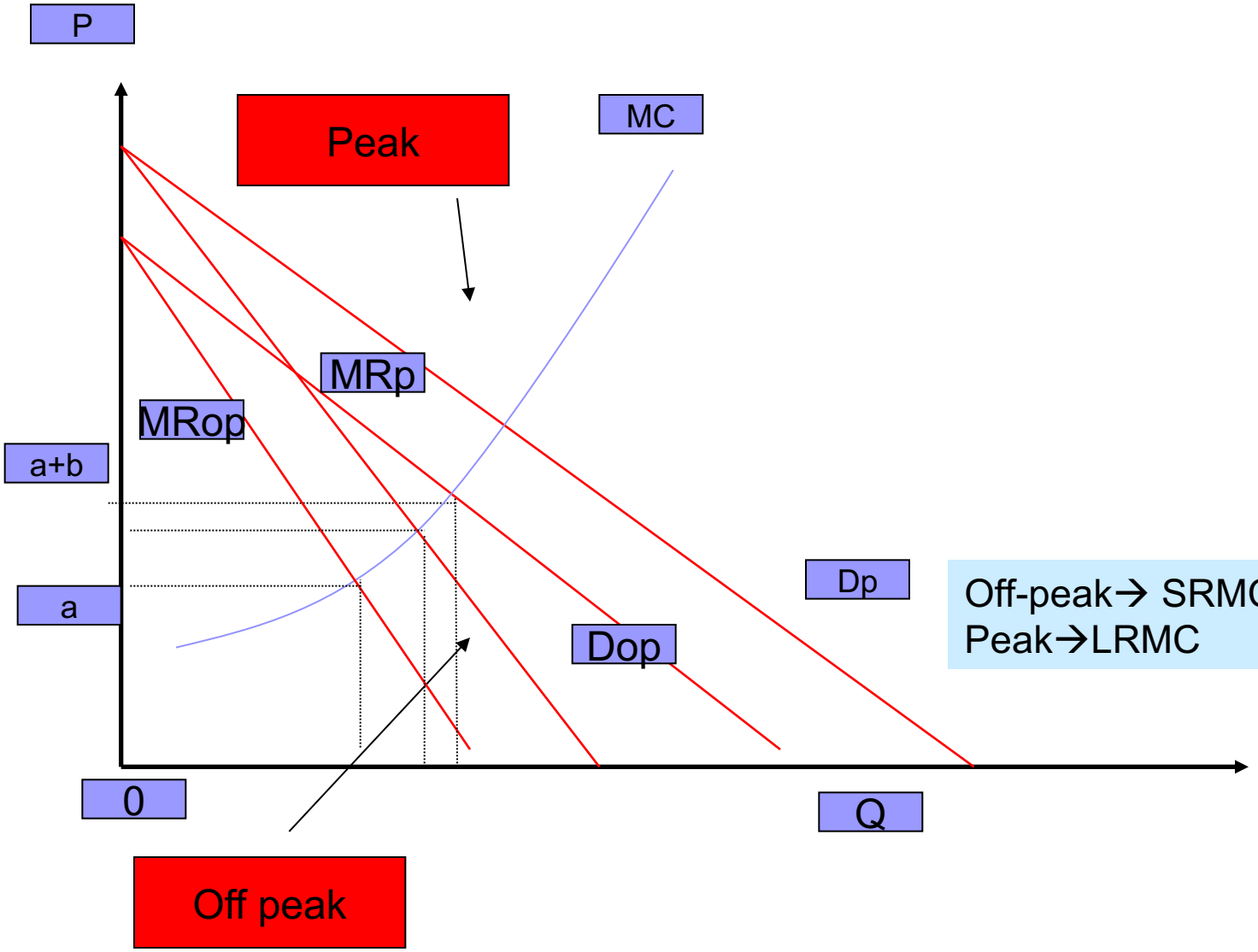
Two methods

- IPP (import parity pricing):*"The price that a purchaser pays or can expect to pay for imported goods; thus the c.i.f. import price plus tariff plus transport cost to the purchaser's location. This and the export parity price together define a range of the possible equilibrium prices for equivalent domestically produced goods* (Definition of IPP by the University of Michigan: see *http://www-personal.umich.edu/~alandear/glossary/i.html*)
- **Cost-plus pricing** is a pricing strategy that is used to maximize the rate of return of companies (Jain, Sudhir (2006). *Managerial Economics*. Pearson Education. ISBN 978-81-7758-386-1.)

Possible explanation?

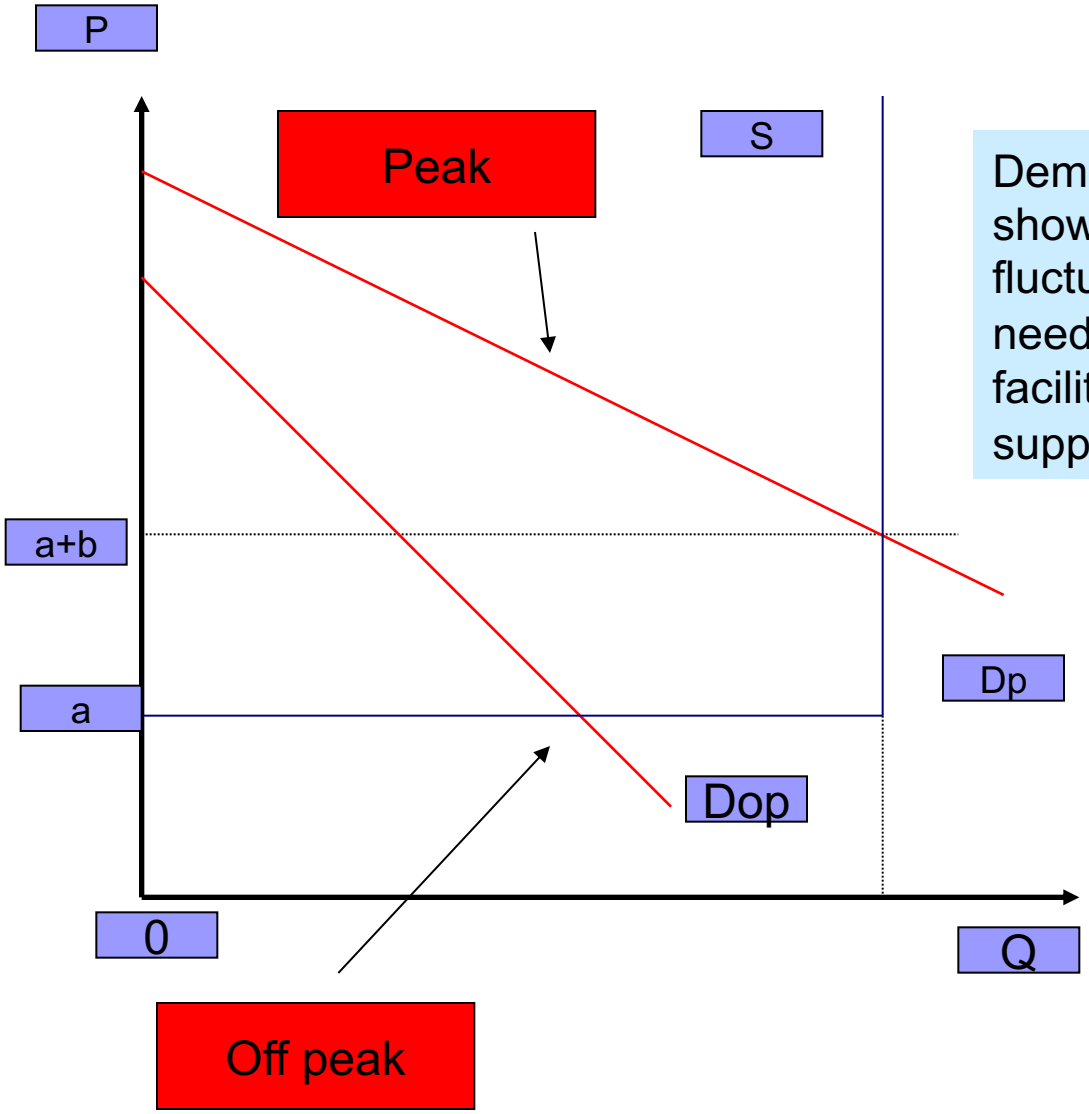
- Firstly, since transport costs are more for products than for crude oil, IPP "inflates" the refinery's profits.
- Secondly, the existence of local refineries is also a problem, since pricing of the import rate does not take into account the actual costs of local production. Using an international benchmark, local specificity is ignored, but this could affect security of supply.
- Finally, domestic prices are subject to the same volatility of international prices, which can be difficult for consumers to accept, especially in developing countries.

Peak and off-Peak Pricing



Off-peak→ SRMC
Peak→LRMC

Peak and off-Peak Pricing



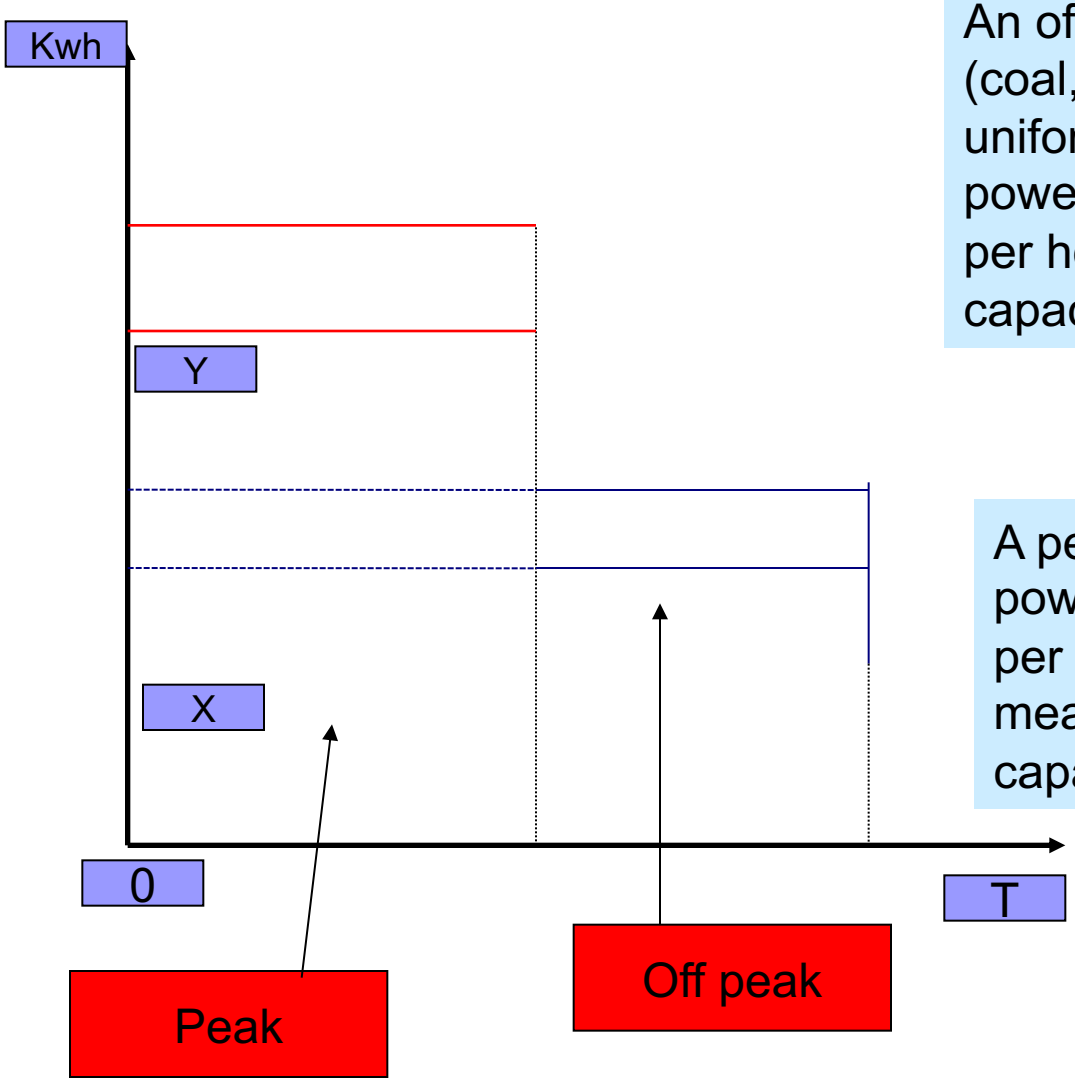
Demand for some energy products shows significant daily and seasonal fluctuations. To address these different needs, suppliers often resort to storage facilities that can be used to balance supply and demand.

Off-peak→ SRMC (a)
Peak→LRMC (a+b)

A conclusion!!!

The simple rule is that consumers who enter the network during of the peak must bear his full responsibility opportunity cost (capacity) and while those who use it electricity during the period off peak should only pay for it short-term marginal cost.

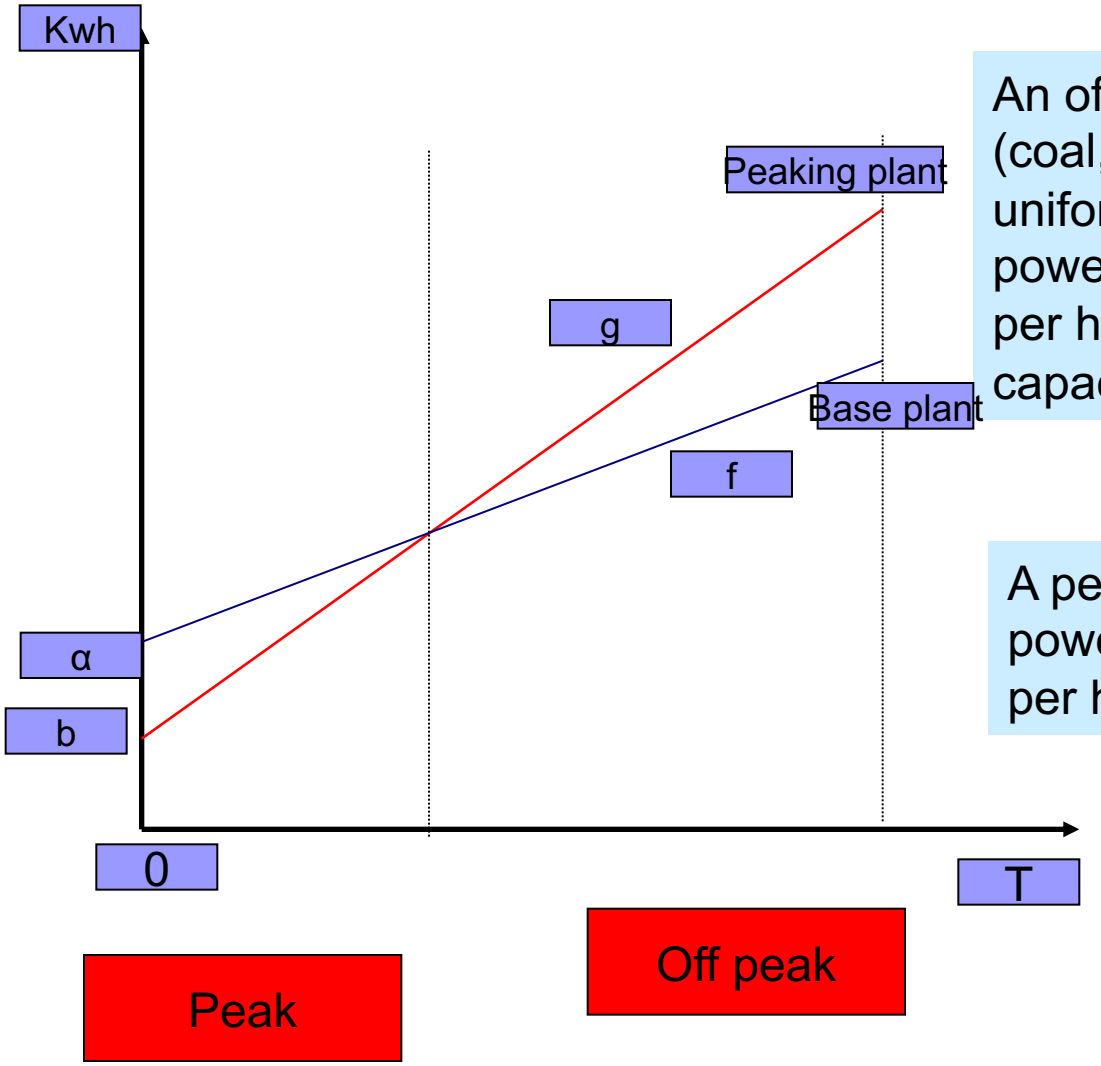
ANNUAL LOAD CURVE
(Munasighe and Warford, 1982)



An off-peak period in which we use (coal, nuclear energy, etc.) to deliver at uniform costs. The fixed cost per power kW is α and the variable cost per hour is f. Also suppose that the capacity x kW.

A peak period with a fixed cost per power kW is b and the variable cost per hour is g. Total load is Y kW, meaning Y - X is the peak load capacity.

Pricing on Peak



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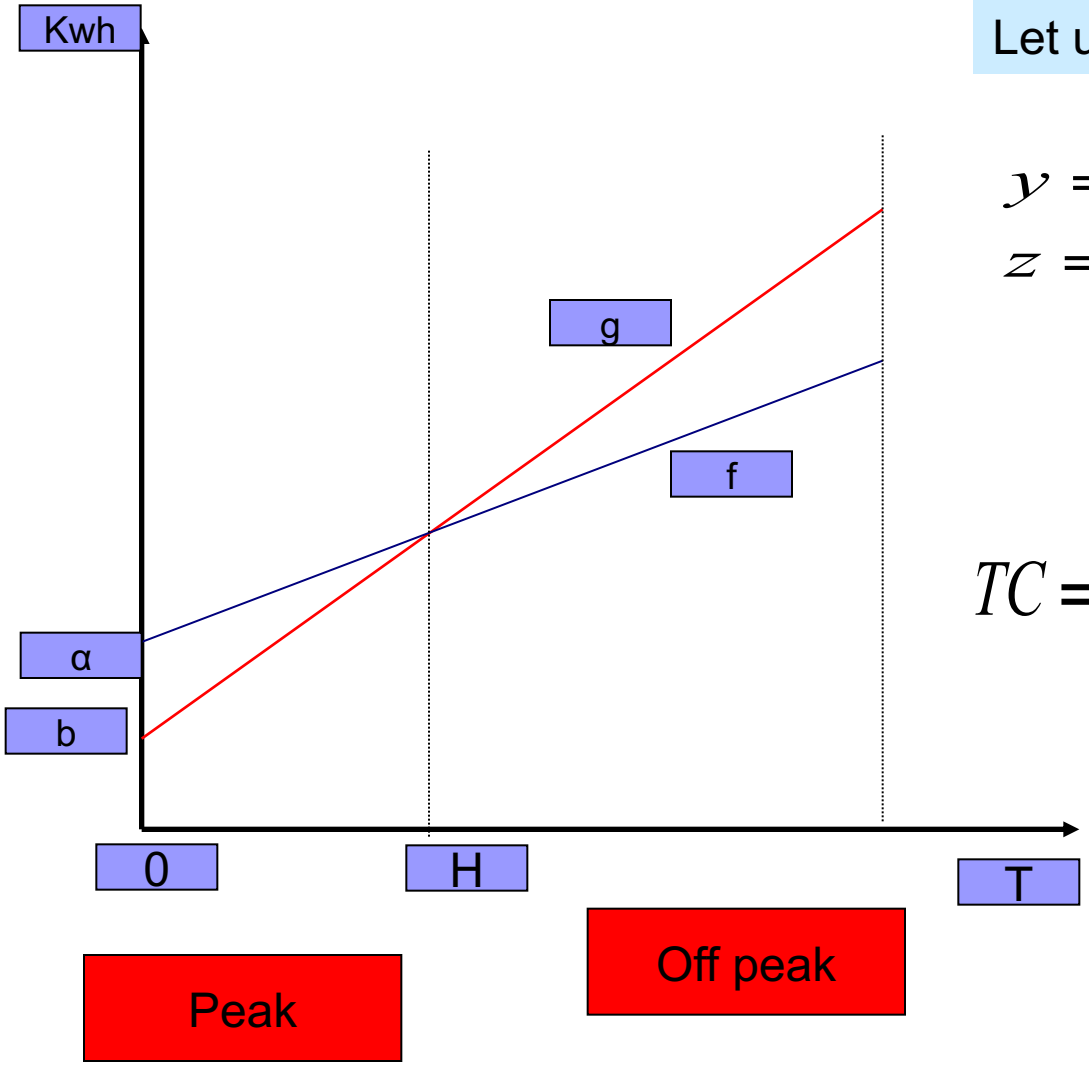
Pricing in peak



Let us assume α>b,f<g.;

$$y = a + fh$$
$$z = b + gh$$

$$\mathrm{H} = \frac{a-b}{g-f}$$

$$TC = X(a + fT) + (Y - X)(b + g\mathrm{H})$$

Pricing in peak

1. Change in demand for peak load

Marginal cost $MC = b + gh$

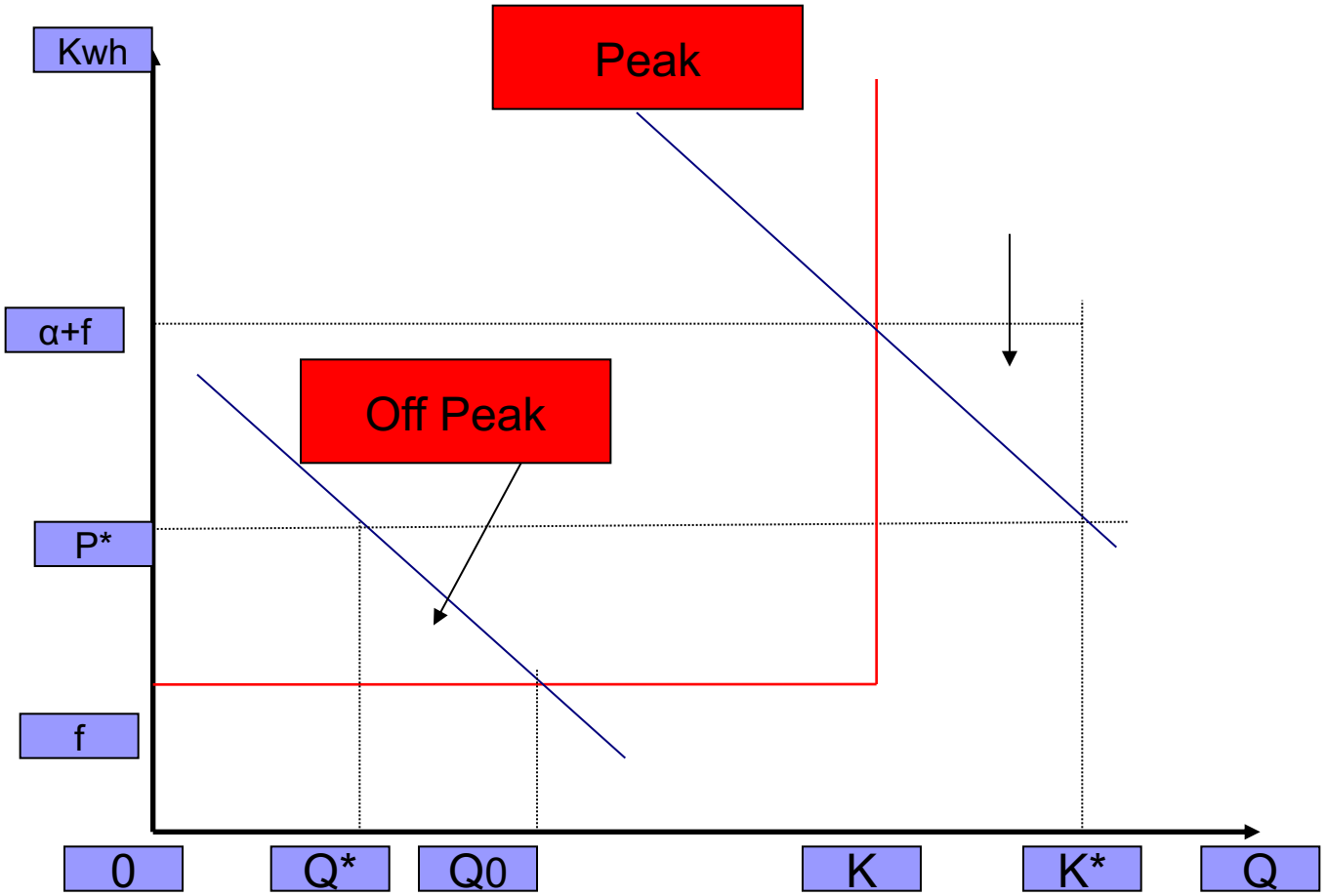
2. Change in demand for off peak load

Marginal cost $MC = f(T - H)$

3. Change in demand for all period

Marginal cost $MC = fT + a$

Loss due to non peaking pricing.



Conclusion

- If demand remains uncertain, the utility has to satisfy demand in every case and therefore pricing should be based on long-term pricing to deal with such uncertainties.
- Pricing must reflect a long-term policy because consumers can only respond for a long time
- SRMC = LRMC
- The long-term marginal costing coincides with the optimal objective allocation of resources and allows for the transfer of the burden on consumers
- Energy investments are irreversible and have a relatively long life span
- The calculation of LRMC is quite difficultIf the division of capital is not the issue then the distinction between short and long term does not exist.
- The dynamic approach to LRMC involves several difficulties.

References

- Bhattacharyya, Subhes C. (2011) Energy Economics: Concepts, Issues, Markets and Governance. Springer (κεφ.13).
- Banks, F (2000) Energy Economics: A modern introduction (pp.99-111)
- Evans, Joanne and Lester Hunt,(2009), International Handbook on the Economics of Energy. Edward Elgar (κεφ.9-12)