Seminar on
African Electrical Interconnection

Module 2- Market Analysis
Module 2- Market Analysis

Contents

1. Chapter I Economic Appraisal of the Interconnection Project: the Case of Pooling Generation Resources

2. Chapter II Demand analysis: the Case of Access to New Markets.
Module 2- Market Analysis
Chapter I Pooling Generation Resources

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2. The economic appraisal
3. Evaluating full operational costs
4. Other rationales
5. Complete cost/benefit analysis
Chapter 1 Pooling generation resources

The rationale

A first level of coordination and integration of electricity systems is reached through the pooling of generation resources

Benefits

• More efficient management of electricity systems
• Positive economic impact on the region
The benefits of the pooling may be evaluated starting from a very simplified modeling of the national electricity systems in which:

- each system is made of a single production/consumptions point
- there is no network grid

\[\text{“Single bus bar system”}\]
Chapter 1 Pooling of generation resources

The economic appraisal

Successful pooling of resources results in a saving of system management costs due to:

- More advanced technologies allowed by the integrated system
- More efficient generation management (complementary load profiles)
- Greater system reliability
Chapter 1 Pooling of generation resources

The economic appraisal

(single bus bar system)

Savings in operational costs = Sum of operational costs of the two systems - Operational costs of integrated system

Operational costs = Generation costs + Transmission costs + Failure costs

Fuel costs

Parameter related to the dimension of the system

Unserved load

One shot system: no investments
Chapter 1 Pooling of generation resources

The economic appraisal

pooling of generation resources

Other benefits

• Reduced need for new capacity
• Reduced need for reserve capacity
• Higher system reliability -> positive impact on the economy
• Cooperation benefits
Chapter 1
Pooling of generation resources
Evaluating full operational costs

It is essential to evaluate the investments needed to match the two grid systems.
Chapter 1

Pooling of generation resources

Other rationales

better efficiency and co-ordination of economic initiatives
better economic system management
exploitation of common primary resources
transfer of electricity from one country to another
other political objectives (strengthening political stability through regional co-operation and integration)
The whole impact of the project need to be evaluated:

- technical operational costs (incl. investments)
- impact on demand structure (sectorial/regional)
- potential for “suppressed demand”
- demand function (ability to pay)
- impact on socio-economic parameters
- potential externalities (environment, future generation etc..)

The estimation may be quite complicate
Module 2- Market Analysis

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Chapter II Demand Analysis: the Case of Access to New Markets

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• Energy Demand Modelling
• Energy Demand Forecast
• Ability to Pay and Tariff Setting
Historical trend: The case of Quebec

Electricity demand - Driving forces
The case of Quebec
Chapter 2 Demand Analysis

Energy Demand Modelling

Models identify the link between socio-economic variables and electricity demand

- reflects the analyst perception of this link
- the more specific (targeted to homogeneous areas) the more trustable the model
- results depend on the underlying hypothesis
- great care to be paid in transferring the model in different areas or time period
- no way to predict break-even points or structural changes
Chapter 2 Demand Analysis

Energy Demand Modelling

Econometric Models
- Socioeconomic explicative vbls
- Mathematical functional relationship

Technico-economic Models
- Demand for durables is the explicative vbl
- Relevance of technology

General equilibrium Models
- Combine macroeconomic and technical approach
Econometric Method

• relates energy sales to socio-economic explanatory variables

\[ Sales \ GWh \ (t) = a + b1(\text{demographic indicator}, t) + b2(\text{economic indicators}, t) \]

• one assumes the existence of stable relationships between energy demand and explanatory variables (GDP, population, households…)

• one needs long historical series
Technico-economic model

- Demand for durables is the explicative variable
- Depends on the technology. Different technology will result in different energy and electricity intensity.
General Equilibrium Model

Demographic Forecast
- Population
- Households

Economic Forecast
- Personal Disposable Income
- GDP growth by sector
- Output level

Fuel Forecast
- Price of oil and gas

Load of residential and agricultural sector
Load of general and institutional
Load of industrial sector
### Important elements

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<th>Structural long term</th>
<th>Residential</th>
<th>Commercial</th>
<th>Industrial</th>
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DSM measures

- Load shaving
- Load shifting
- Valley filling
- Load reduction
- Strategic load
Chapter 2 Demand Analysis

Energy Demand Forecast

Demand model based on present vbls

Demand model in the future

Forecasting is a very delicate operation

Great care to be paid at:
Structural changes affecting the demand model
Reliability of available data
Potential for suppressed demand
Chapter 2 Demand Analysis

Energy Demand Forecast

The Scenario approach

Demand model over present vbls

Future demand scenario “low”

Future demand scenario “medium”

Future demand scenario “high”
Chapter 2 Demand Analysis

Ability to Pay and Tariff Setting

Time

T1

Project viability

T2

Tariff structure

Economic Revenues

Need to evaluate the impact of different tariff structures
Different tariff structures

Different economic return

Different impact on other relevant objectives
- Socioeconomic objectives
- Ability/willingness to pay

Chapter 2 Demand Analysis
Ability to Pay and Tariff Setting