Electricity deregulation in Israel: Is it likely to succeed?

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Background: Israel’s electricity market characteristics

Service territory: 22,145 km²

Population: 6.7 million

Israel Electric Corp (IEC): Integrated government-owned utility

A monopoly serving 2.2 million premises at rates set under cost-of-service regulation
IEC’s system characteristics in 2003

- Installed capacity: 10,117 MW
- Peak demand: 8,570 MW
- Sales: 41,721 GWh
- Transmission: 400-kV grid
- No interconnection with neighboring countries
- Small but growing number of IPPs: 65MW installed
Key trends

- GDP growth: 3-5% per year for the next 10-15 years
- Electricity demand growth: 3-5% per year for the next 10-15 years, requiring annual addition of a new 500-MW plant
- High reliability critical to Israel’s economy, particularly high-tech industry
- Which policy initiative is more urgent: funding for expansion or market reform? The government chose the latter, which will be shown to be misguided
Reform proposal

In June 2003, the Israeli government decided to implement a UK-style electricity market reform in two steps:

1. 2006: Unbundling generation, transmission, distribution, customer services

2. 2007-2012: Deregulation followed by privatization
Research Objective

Compare prices, profits and consumer surplus by market regime: regulation vs. deregulation, thereby assessing if deregulation can improve the sector’s performance.
Cost shares of electricity price (IEC) and telephony price (Bezeq) in 2003

IEC – electricity price

- Fixed costs 40%
- Fuel cost 39%
- O&M 21%

Bezeq – telephony price

- Fixed costs 37%
- O&M 63%

What is the potential gain of deregulation?
Model setup: Two time-of-day market demands supplied by multiple firms using two technologies

- Market demand: $Q_t = a_t + b_t P_1 + d_t P_2$
  $t = 1$ (peak), $t = 2$ (off-peak)

- Output of firm $j$ by time-of-day: $Q_{ijt}$
  $i = 1$ (CFG: coal-fired generation)
  $i = 2$ (CCGT: combined cycle gas turbine)
  $t = 1$ (peak), $t = 2$ (off-peak)

- Cost: $C_{ijt} = \theta_i + c_i Q_{ijt}$
  with $\theta_1 > \theta_2$ and $c_1 < c_2$
Regulation: Average cost ratemaking

Breakeven:
Total revenue = Total cost

Equilibrium:
Monopoly output by time-of-day period = Market demands at breakeven prices by time-of-day period
Deregulation: Cournot equilibrium

$K$ identical firms, each uses $k$ CFGs

$N$ identical firms, each uses $n$ CCGTs

$(N+K)$ firms generate by time-of-day period according to the Cournot conjecture
Deregulated market prices

(when cross price elasticities are zero)

\[ P_1 = \frac{a_1 + Kc_1 + Nc_2}{K + N + 1} \quad P_2 = \frac{a_2 + Kc_1 + Nc_2}{K + N + 1} \]

If \( K \) or \( N \) increases, prices decline, thus lowering profits but raising consumer surplus
Application to Israel

Data assumptions

Total output in 2010: 58.7 million MWh based on an annual growth of 5%

Own (cross) price elasticities: -0.25 (0.05)

Generator size: CFG: 650 MW; CCGT: 360 MW

Costs:

\[ \theta_1 = 71.2 \text{ $ million/year} \quad c_1 = 15.3 \text{ $/MWh} \]
\[ \theta_2 = 28.2 \text{ $ million/year} \quad c_2 = 21.6 \text{ $/MWh} \]
This scenario assumes two coal-using producers ($K=2$), price elasticity = -0.25 (0.05), and efficiency improvement = 15%. This figure shows that the results are insensitive to the number of firms.
This figure compares regulated rates and deregulated prices by time-of-day. The deregulation scenario assumes 15% efficiency improvement, $K = 2$ and $N = 3$. 
This figure compares consumer surplus, industry profit and total benefit by market regime. The deregulation scenario assumes 15% efficiency improvement, $K = 2$ and $N = 3$. The regulation scenario under the breakeven constraint implies zero profit; and hence, consumer surplus = total benefit.
Net benefits under deregulation do not vary with the number of firms due to the large share of fixed costs.

Unless electricity demands have price elasticities under -0.5, deregulation in Israel will likely yield smaller net benefits, and certainly smaller consumer surplus, than a regulated market.
Reform in Israel is not about implementing a UK-template, a one-size-fits-all approach that has failed in many parts of the world and is unlikely to succeed in Israel.

It is about a process that aims to:

- Have an able and knowledgeable regulatory staff;
- Implement regulatory transparency;
- Promote active participation of stakeholders, including the government, utility, end-users, public interest groups; and
- Make the regulatory agency accountable for its actions.