Power Generation (Non-renewables): Alternative Financing Models-New Capacity

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I. Financing options linked to generation type

Non-renewables

- Coal
- Natural gas
- Petroleum
- Nuclear

Renewables

- Biomass
- Biofuel
- Geothermal
- Hydro
- Marine
  - Current
  - Osmotic
  - Thermal
  - Tidal
  - Wave
- Solar
- Wind

II. Financing linked to four Phases of power delivery

Production
Transmission
Distribution
Collection & (Tariff rates)

III. Financing is linked to their respective costs/return

Net return is a policy factor in most countries dominated by the public sector

1. Private equity financing (ownership) is primarily concerned with the Production phase & O & M in the other phases

Other phases present access /control problems and regulations constraints

2. Lower cost/KWH , lower risk, higher rates of return Provide financing viability

cost vs. tariff policy

3.Concern is with levelized cost of production In terms of choice of type of production

Costing of other factors can be taken :

Safety/ risk

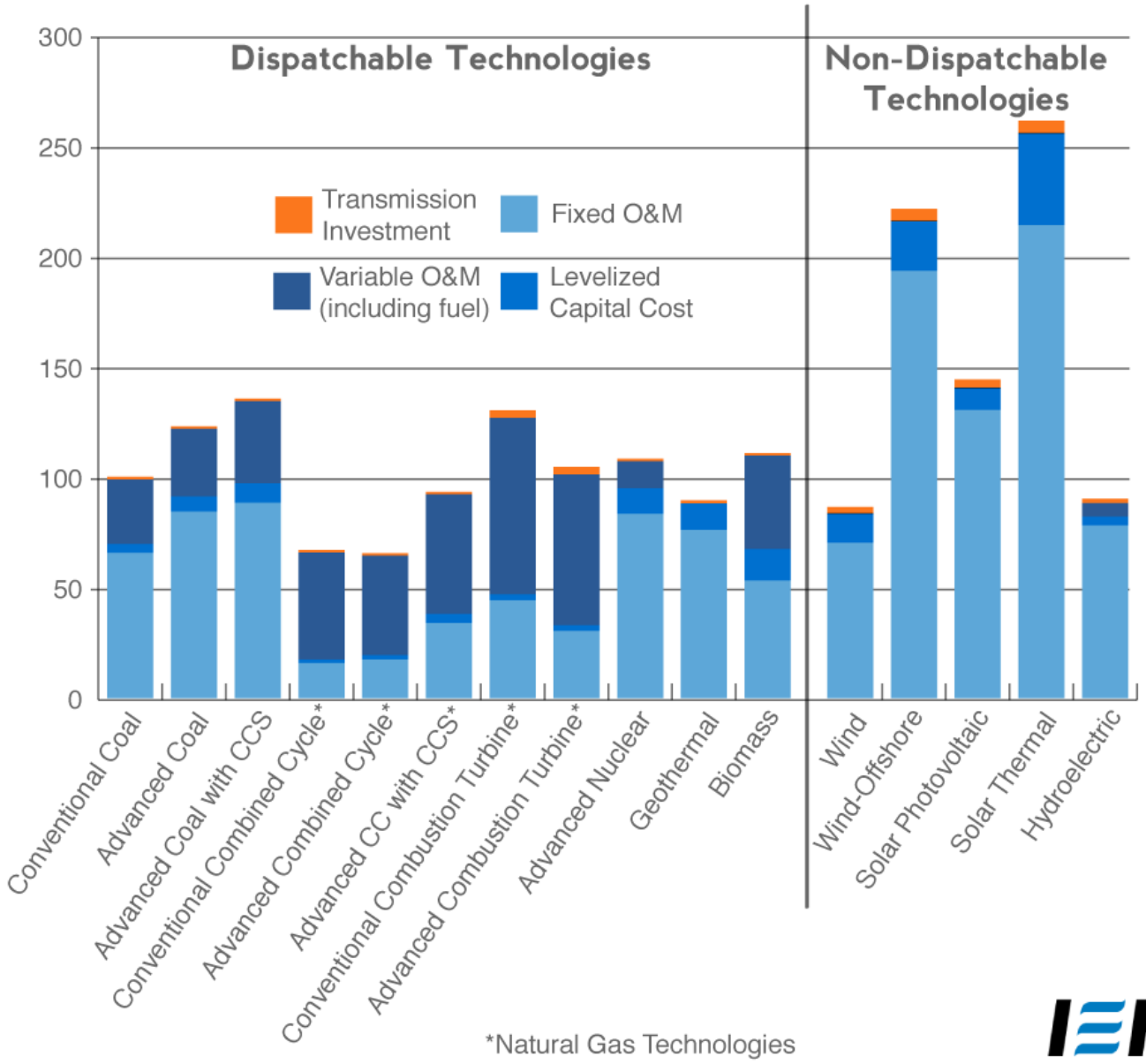
Environment

Depletion of non-renewable resources

$$\mathrm{LCOE} = \frac{\text{sum of costs over lifetime}}{\text{sum of electrical energy produced over lifetime}} = \frac{\sum_{t=1}^{n} \frac{I_t + M_t + F_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{E_t}{(1+r)^t}}$$

I_t	:	**investment expenditures in the year t**
M_t	:	operations and maintenance expenditures in the year t
F_t	:	fuel expenditures in the year t
E_t	:	electrical energy generated in the year t
r	:	discount rate
n	:	expected lifetime of system or power station

Estimated Levelized Cost of New Electric Generating Technologies in 2018 (2011 $/megawatthour)



Source: Energy Information Administration, *Annual Energy Outlook 2013*

A Tariff rate based on average cost means:

Many become uncompetitive

Estimated Levelized Cost of New Dispatchable Generation Resources, 2018

Plant type Dispatchable Technologies	U.S. average levelized costs (2011 $/megawatthour) for plants entering service in 2018 Capacity factor (%)	Levelized capital cost	Fixed O&M	Variable O&M (including fuel)	Transmission investment	Total system levelized cost
Conventional Coal	85	65.7	4.1	29.2	1.2	100.1
Advanced Coal	85	84.4	6.8	30.7	1.2	123
Advanced Coal with CCS	85	88.4	8.8	37.2	1.2	135.5
Natural Gas-fired						
Conventional Combined Cycle	87	15.8	1.7	48.4	1.2	67.1
Advanced Combined Cycle	87	17.4	2	45	1.2	65.6
Advanced CC with CCS	87	34	4.1	54.1	1.2	93.4
Conventional Combustion Turbine	30	44.2	2.7	80	3.4	130.3
Advanced Combustion Turbine	30	30.4	2.6	68.2	3.4	104.6
Advanced Nuclear	90	83.4	11.6	12.3	1.1	108.4
Geothermal	92	76.2	12	0	1.4	89.6
Biomass	83	53.2	14.3	42.3	1.2	111

IER

lew Non-Dispatchable Generation Resources, 2018

e levelized costs (2011 $/megawatthour) for plants entering service in 2018

	Levelized capital cost	Fixed O&M	Variable O&M (including fuel)	Transmission investment	Total system levelized cost
34	70.3	13.1	0	3.2	86.6
37	193.4	22.4	0	5.7	221.5
25	130.4	9.9	0	4	144.3
20	214.2	41.4	0	5.9	261.5
52	78.1	4.1	6.1	2	90.3

IV. FINANCING OPTIONS

IVa. Government balance Sheet Financing

Public Sector Financing (government)

Expenditures

Revenues

Deficit financing

Commercial sources

Non-commercial

Budget Financing

Commercial sources
- Treasury bills
- Euro bonds
- Commercial banks

Non-commercial sources
- Central bank
- Multilateral-earmarked-WB Regional Funds
- Bilateral- earmarked

1. Commercial sources

Treasury bills and Euro bond rates in most (non-oil rich) MENA countries are
400 to 500 basis points higher than international AAA rated securities

RISKS

-Higher debt ratios- higher risk rating
-Higher cost to private sector
-Crowding out of private sector
-Lower growth rates

2.Central bank financing

Higher liquidity

Higher inflation

Higher interest rates

Lower growth rates

Lower competitiveness and lower exports

3.Concessional Financing at Lower interest rates

International IBRD

Regional development financing institutions

Bilateral & National funds

Risk inherent in public sector operated Power generation

Higher risk is associated with

- Financing-debt burden
- Management risks-inefficiency

Transparency/corruption

IVb. Off-Balance Sheet Financing

PPP-Partnership with Private Sector

The term ‘Public Private Partnerships’ or ‘PPPs’ normally describes how a project is funded and operated through a contract with private sector

PPP-Private Sector Consortium

Typically, a private sector consortium forms a
A "Special Purpose Company" (SPC) company to design, build, maintain and operate the asset for a s specified time frame, say 25 years, after which it will hand it back to the government .

Benefits of SPC

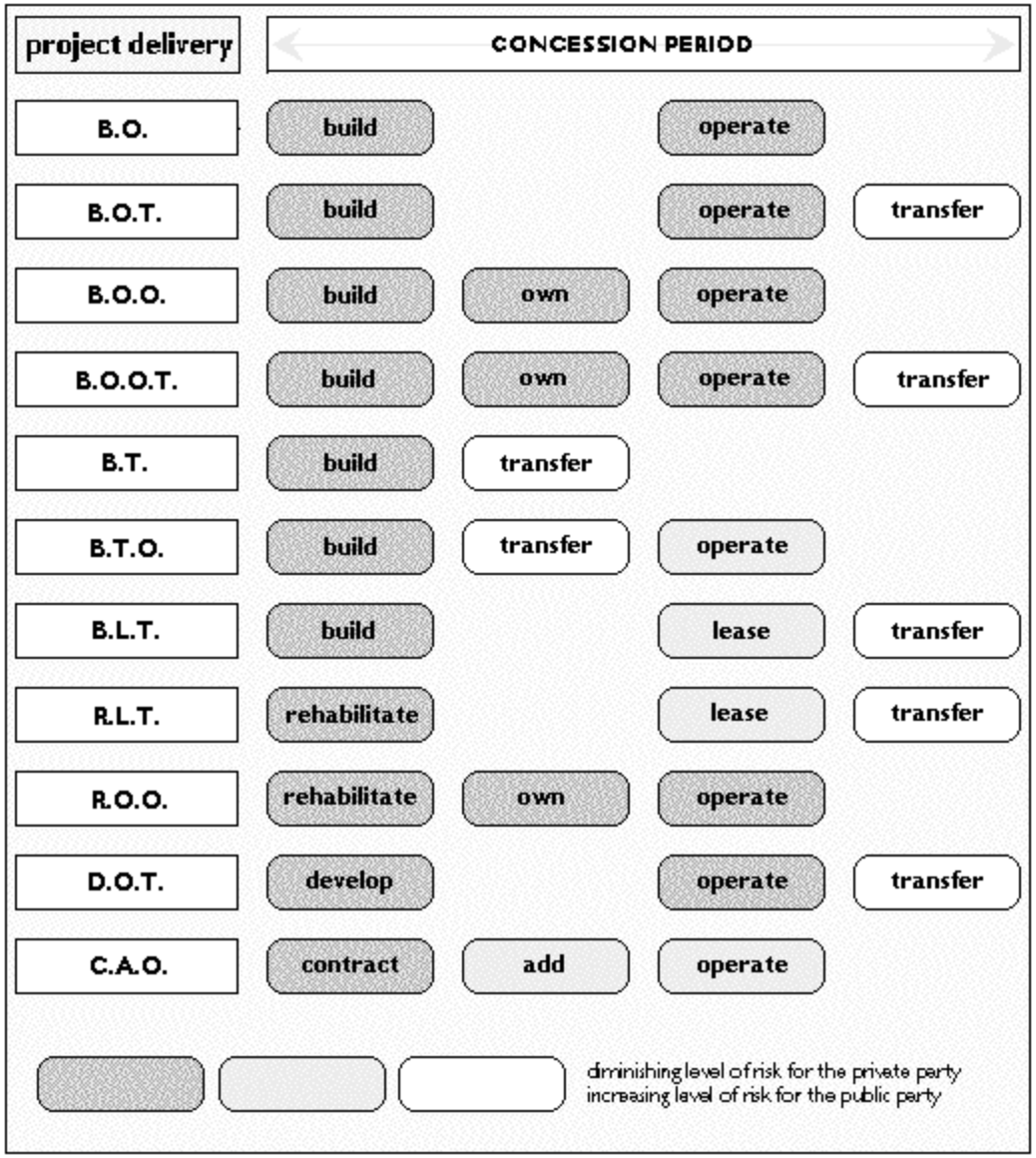
1. Leverage of debt finance to do more projects and therefore speed up infrastructure development
2. Transfer risk to the Private Sector and gain private sector delivery efficiencies
3. Integration of the design, build, operation service leads to innovation
4. Whole life cost and fiscal benefit of an “off-balance sheet” accounting of the capital costs (CAPEX)
5. The PPP approach, which incorporates performance criteria (strict KPIs) and quality and durability requirements (such as hand back standards) leads to a focus on service delivery, which ultimately benefits customers.

Forms of PPP

BOOT: Build Own Operate Transfer

DBO: Design Build Operate project

BOT: Build Operate and Turn
Common feature: eventually the government has to raise the needed capital


project delivery
CONCESSION PERIOD
B.O.
build
operate
B.O.T.
build
operate
transfer
B.O.O.
build
own
operate
B.O.O.T.
build
own
operate
transfer
B.T.
build
transfer
B.T.O.
build
transfer
operate
B.L.T.
build
lease
transfer
R.L.T.
rehabilitate
lease
transfer
R.O.O.
rehabilitate
own
operate
D.O.T.
develop
operate
transfer
C.A.O.
contract
add
operate
diminishing level of risk for the private party
increasing level of risk for the public party

Common Feature of BOTs

Government has to eventually secure financing as ownership is transitional

For some countries there is concern with ownership

Risk implied in BOT

Management risk

Corruption in concession contracts

1/26/2016

Financing risk

Reform risks

Revenue risk

IPP Model contracts with

Long Term Purchase Agreement principally used in power production

Known as IPP

An **independent power producer** (IPP) or **non-utility generator** (NUG) is an entity,[1] which is not a public utility, but which owns facilities to generate electric power for sale to utilities and end users.[2] NUGs may be privately held facilities, corporations, cooperatives such as rural solar or wind energy producers, and non-energy industrial concerns capable of feeding excess energy into the system.[3]

IPP bidding

Prequalified energy producers
The “biddable” item is price of KWH without fuel
Contracts are for 20 to 25 years (life of generators)

IPPs

Ensure their own financing

The contracting company does not require government financing

IPP bidding

Bids are called for internationally

Government or electricity utility has to provide location

The Turkish contract with Lebanon has elements of IPP but it is a short

Advantages of IPP

Private management-better management

private maintenance and operation

Transfer of technology

Capacity building

Advantages of IPP…..

Limits corruption

Bidding is based on international standards

Bidding main component is price of KWH-excluding fuel cost

Advantages of IPP….

Attracts only profitable projects

Applied mostly to non-renewable projects

Advantages…..

Government retains competition

By outsourcing to different producers based on bids/ or restrict multiple bidding by single producer

IPP is similar to contracts granted in oil & gas exploration & development

Ownership of facilities are retained by developer.

Developer can secure investment guarantee from MIGA

Risks in IPP modality

Commercial risks

- Market demand
- Cost overruns
  - Insolvency of purchaser (client)
  - Local infrastructure risks
    - Transmission
      - Distribution
      - Collection

Political risks

Delay in in ratifying agreements

lack of transparent laws and regulatory regimes can produce uncertainty in pricing electricity

Ambiguity in environmental regulations & tax codes

IPP

In IPP benefits outweigh costs

IPP profusion

Very popular In advanced economies

Very successful in many African and Latin American countries

IVc- Off balance sheet financing

Complete privatization of existing and new capacity

Government oversight & regulator

Thank you