


CRITICAL SUCCESS FACTORS FOR ELECTRICITY GENERATION PROJECTS BASED ON LNG

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BBG regasification terminal and BBE CCGT power plant. Bilbao

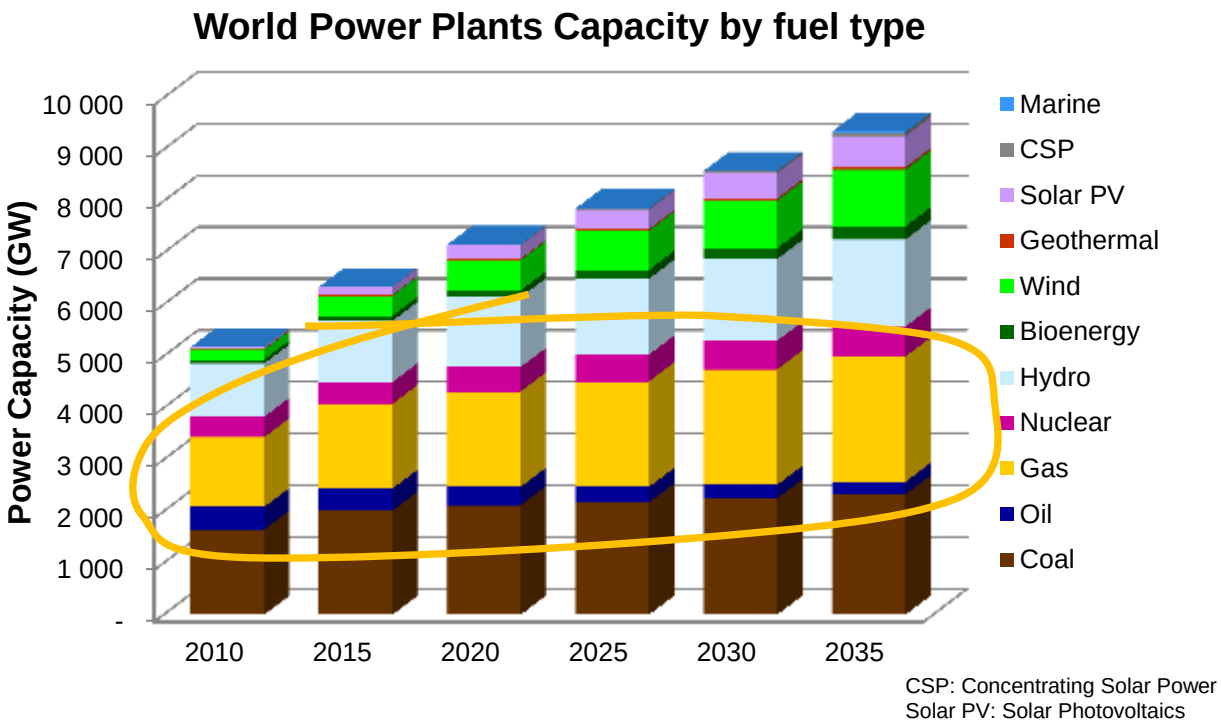
1 Introduction and purpose

Energy is one of the key factors in economic development

Oil prices have driven power generation costs extremely high in many markets

Natural gas is seen as one solution to reduce the energy bill

Not all projects manage to fulfil their objectives in time and within budget



CSP: Concentrating Solar Power
Solar PV: Solar Photovoltaics

Source: World Energy Outlook 2012. IEA

This presentation outlines the challenges that the sponsor of an LNG power generation project faces, the ways to overcome them and be successful

2 Infrastructure. The facilities

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LNG Discharge and reception → LNG Storage → LNG Regasification

LNG Terminal

Electricity generation → Transformation and Delivery to the network

Electric power plant

ECOELECTRICA regasification terminal and power plant. Puerto Rico

Typology Onshore and Offshore

Onshore

81 Terminals

Sendout capacity range:1 to 30 Bcma

LNG Storage: 30,000 to 2,700,000 m^3

1 or 2 berthing points

Offshore

14 Terminals

Regasification vessel

11 Terminals

Dock sendout

8 Terminals

Sendout capacity range:1 to 4 Bcma

LNG Storage: 125,000 to 150,000 m^3

0 or 1 additional berthing point

Buoy sendout

3 Terminals

Sendout capacity :4 Bcma

LNG Storage: 138,000 to 150,000 m^3

No berthing point

GBS

1 Terminal

Sendout capacity: 8 Bcma

LNG Storage: 250,000 m^3

1 berthing point

Mixed configurations

Vessel storage and onshore regasification

2 Terminal

Sendout capacity: 2 Bcma

LNG Storage: 162,000 m^3

1 berthing point

Note: Typical ranges

Power plants typology

Steam cycle

Potential fuels: solid (coal, wood, waste), liquid (oil), gas (LPG, natural gal)

Efficiency: 25% - 45%


Steam cycle power plant
(Narcea Power Plant. Spain)

Gas turbine

Potential fuels: liquid (diesel oil), gas (LPG, natural gas)

Open cycle gas turbine

Potential fuels: liquid (diesel oil), gas (LPG, natural gas)

Efficiency: 30% - 35%

Combined cycle gas turbine

Potential fuels: liquid (diesel oil), gas (LPG, natural gas)

Efficiency: 45% - 55%


Combined cycle gas turbine
(Barcelona Port Power Plant. Spain)

Reciprocating engine

Potential fuels: liquid (oil), gas (LPG, natural gas)

Reciprocating engine without heat recovery

Potential fuels: liquid (oil), gas (LPG, natural gas)

Efficiency: 45% - 55%

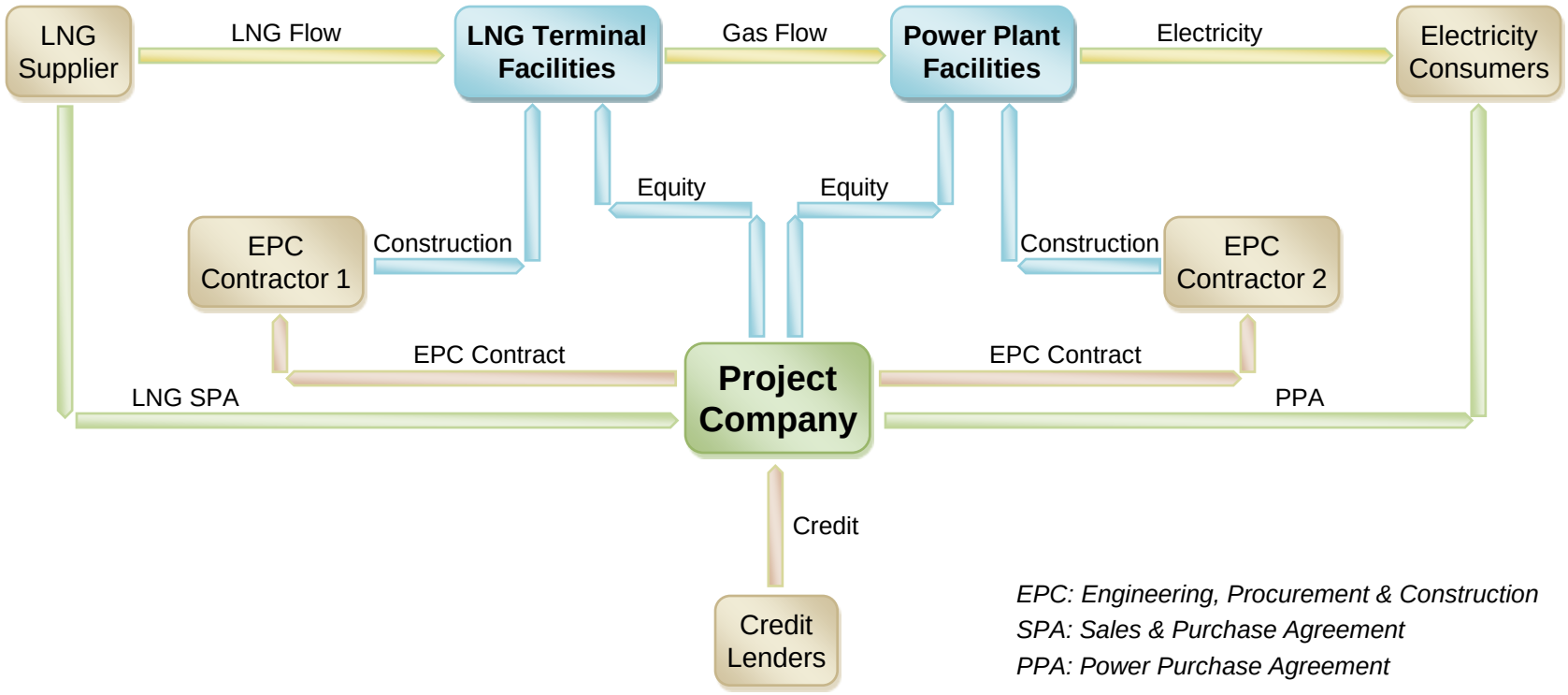

Reciprocating engines power plant
(Iberafrica Power Plant. Kenya)

Reciprocating engine with heat recovery

Potential fuels: liquid (oil), gas (LPG, natural gas)

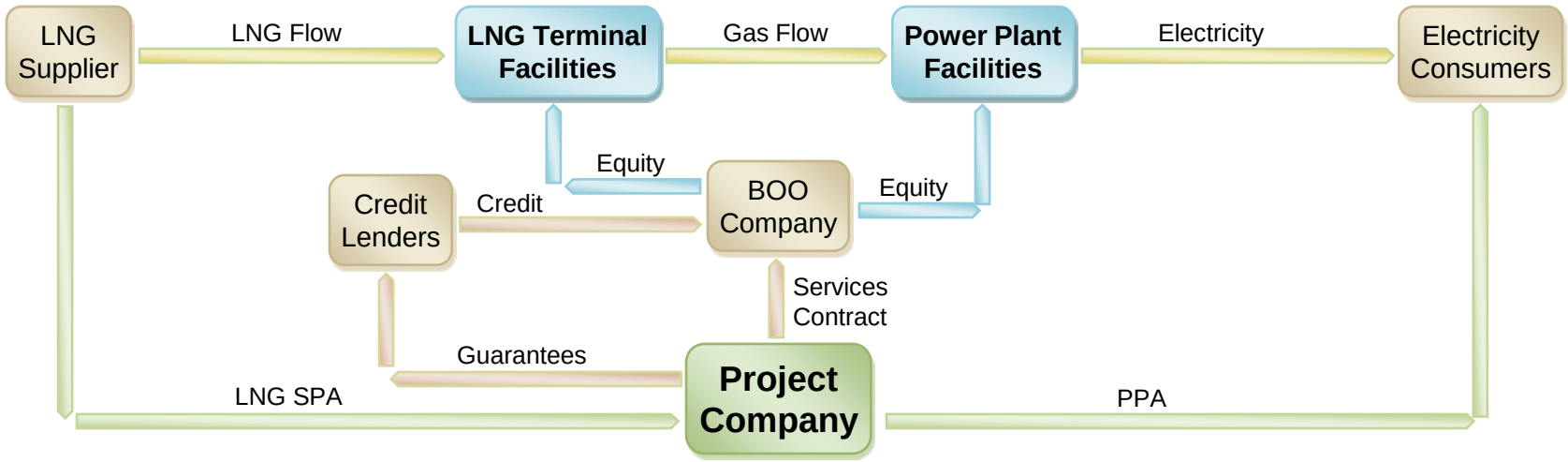
Efficiency: 50% - 60%

Model A



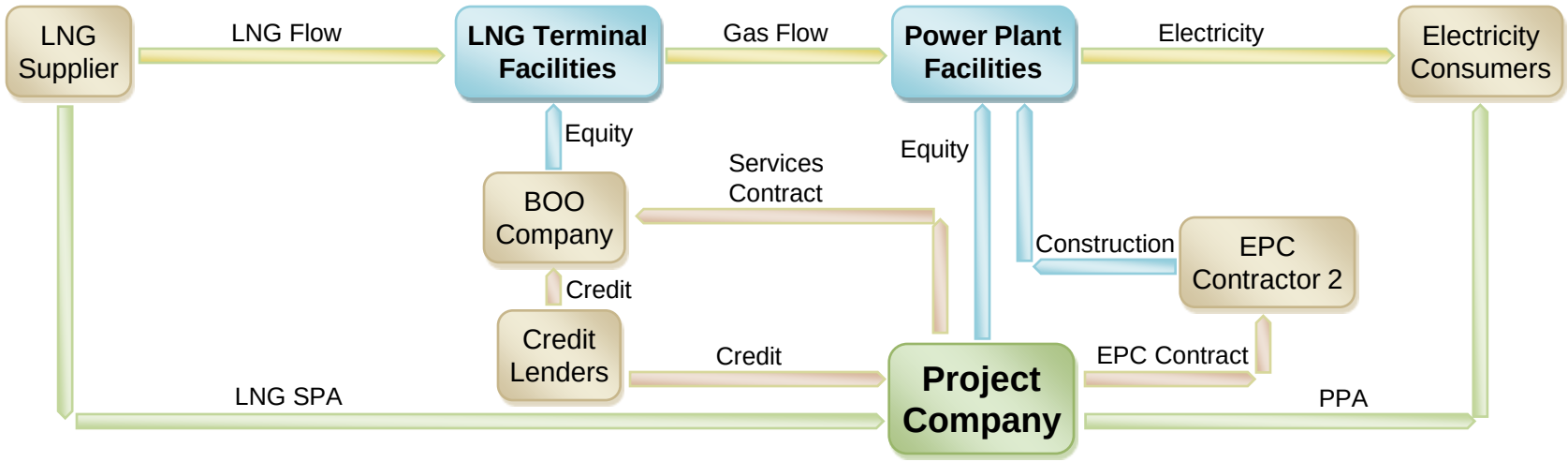
EPC: Engineering, Procurement & Construction
SPA: Sales & Purchase Agreement
PPA: Power Purchase Agreement

Model B



BOO: Build, Own & Operate
SPA: Sales & Purchase Agreement
PPA: Power Purchase Agreement

Model C



BOO: Build, Own & Operate
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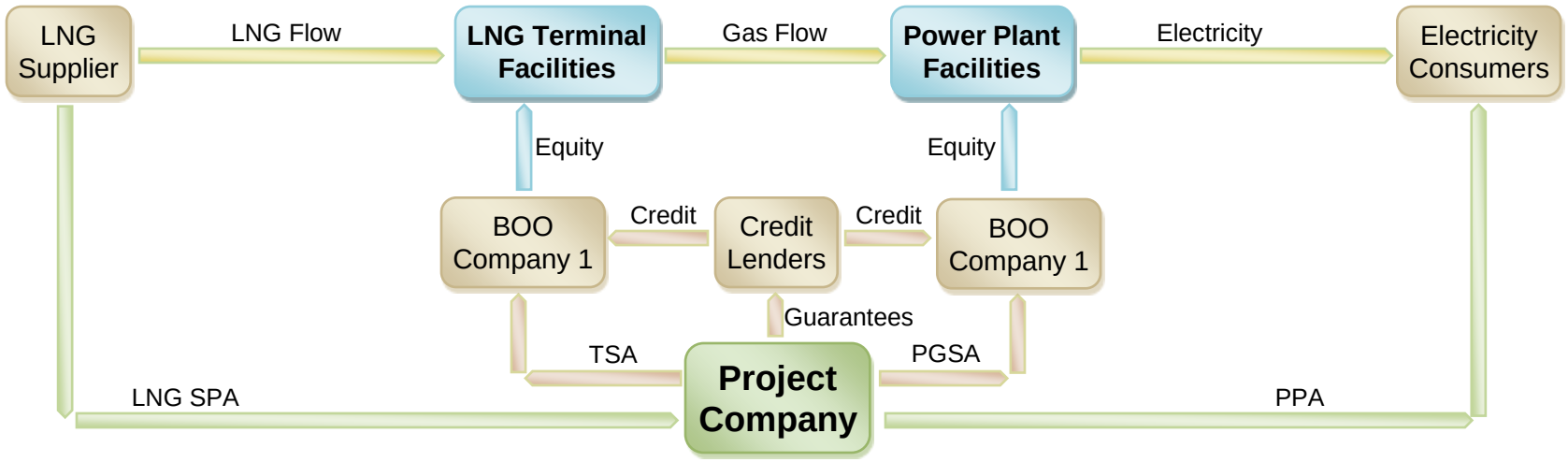
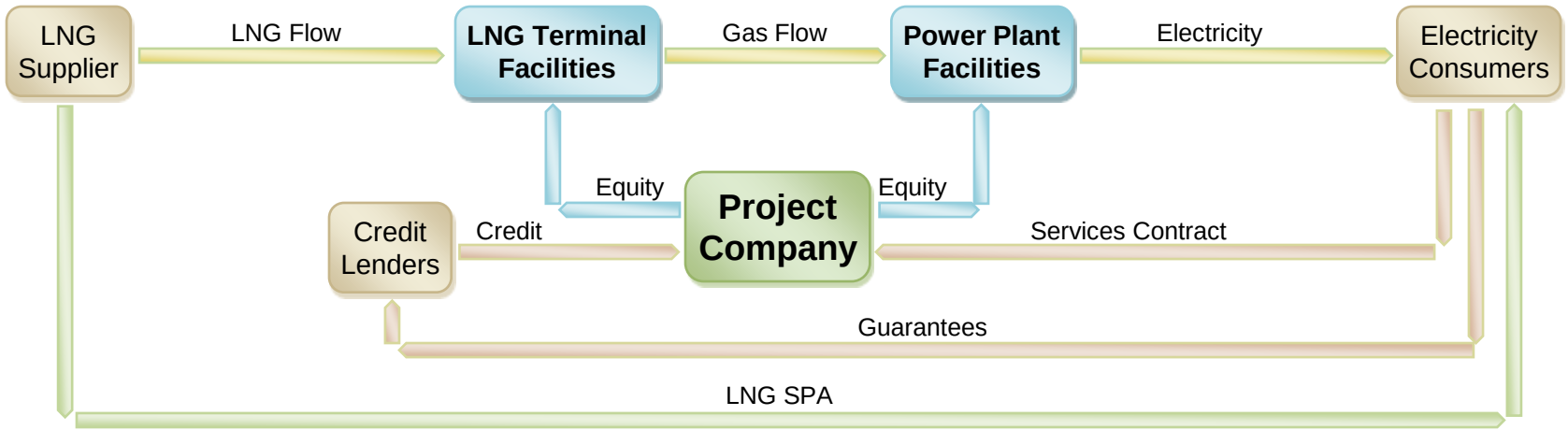
Model D



BOO: Build, Own & Operate
TSA: Terminal Services Agreement
PGSA: Power Generation Services Agreement
SPA: Sales & Purchase Agreement
PPA: Power Purchase Agreement

Tolling Model



SPA: Sales & Purchase Agreement

3 Business challenges

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Power Market

- Power demand
- Uses of electricity
- Seasonality
- Medium to short term
- Reliability
- Conditions precedent
- Price issues

- PPA
- Spot power market with no firm commitment

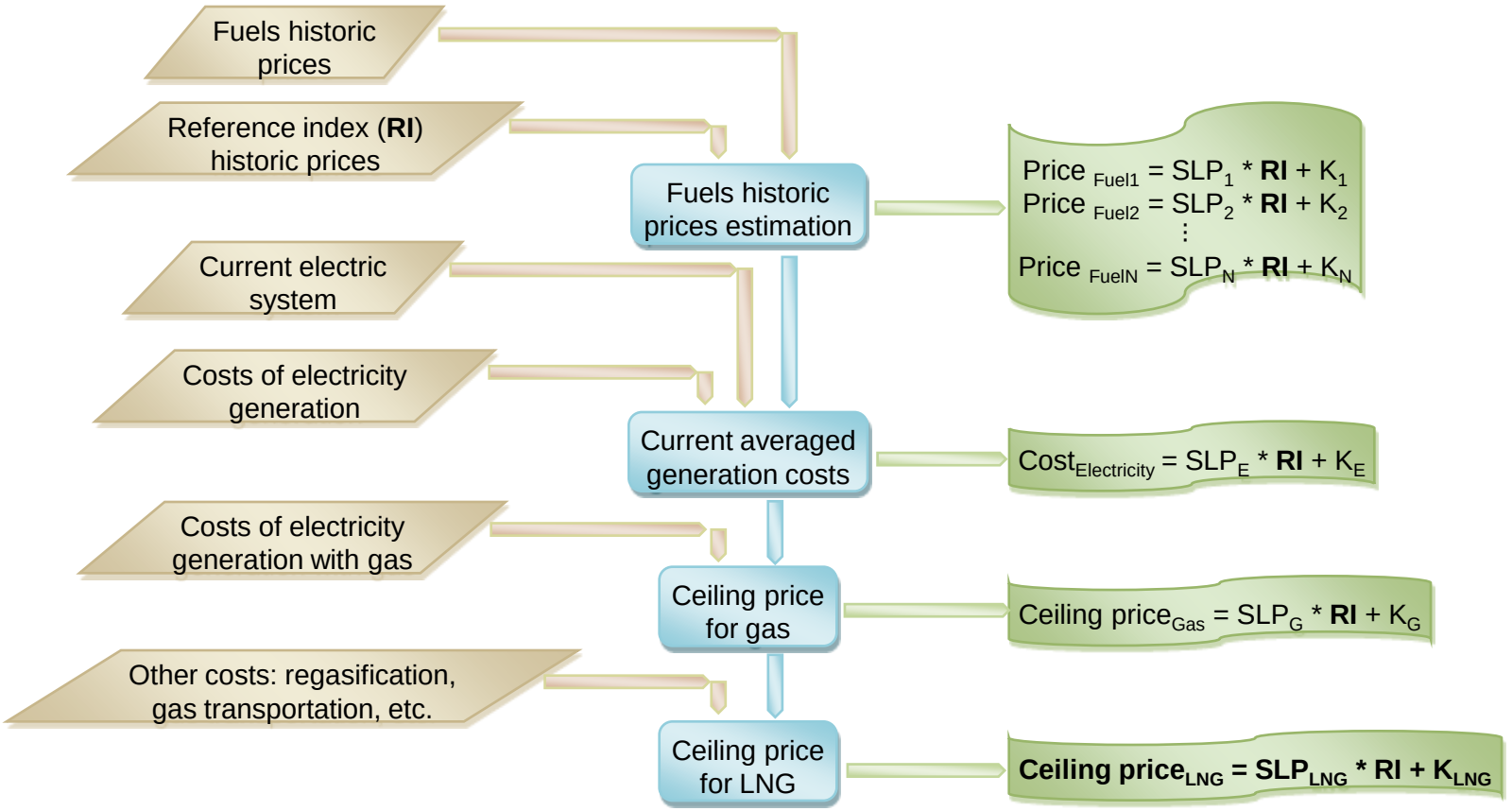
LNG Market

- Global market
- Steady production
- Take-or-pay
- Medium to long term
- Guaranties
- Conditions precedent
- Price issues

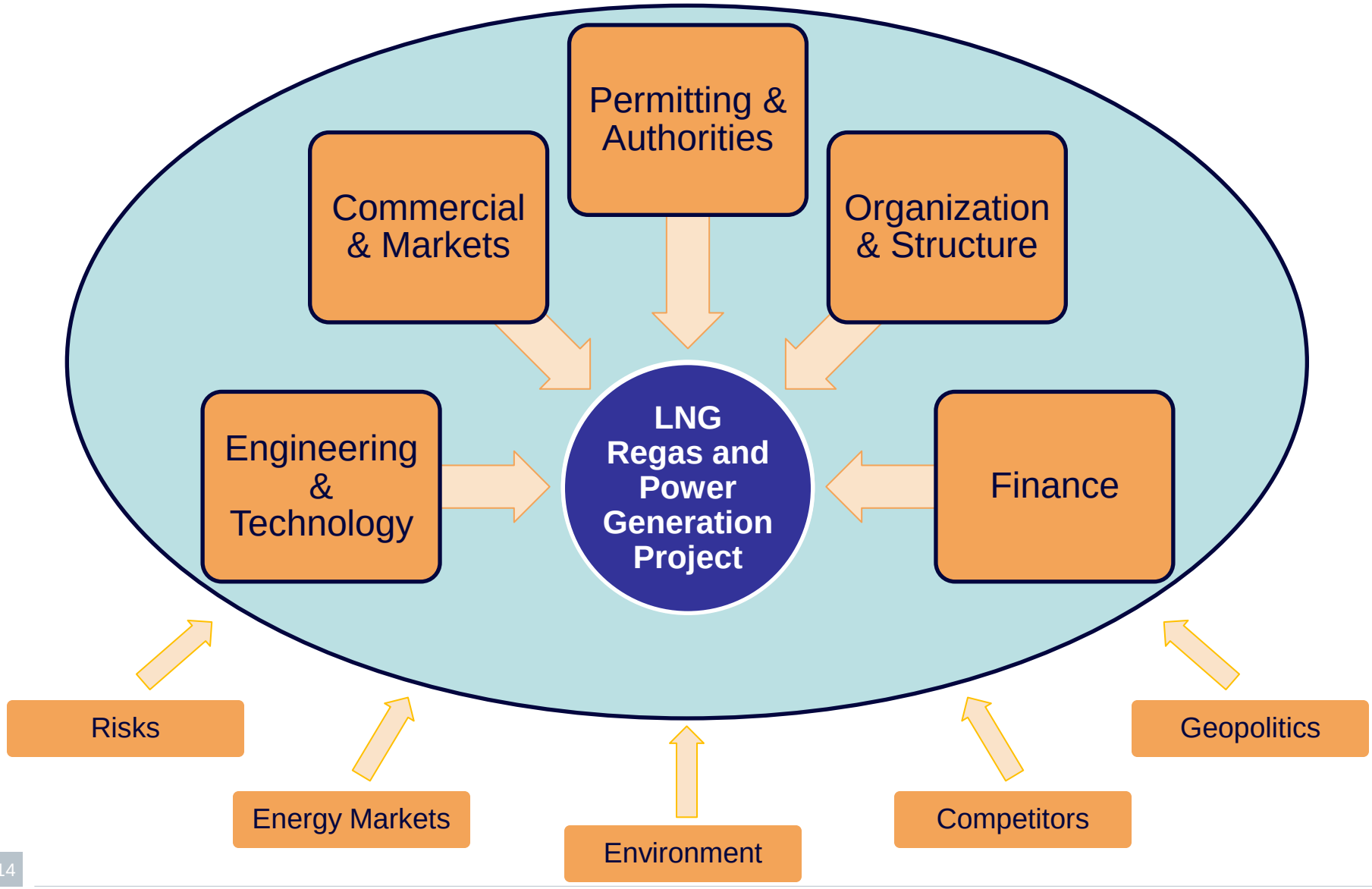
- LNG SPA
- Reduced LNG spot market

3 Power generation economic model

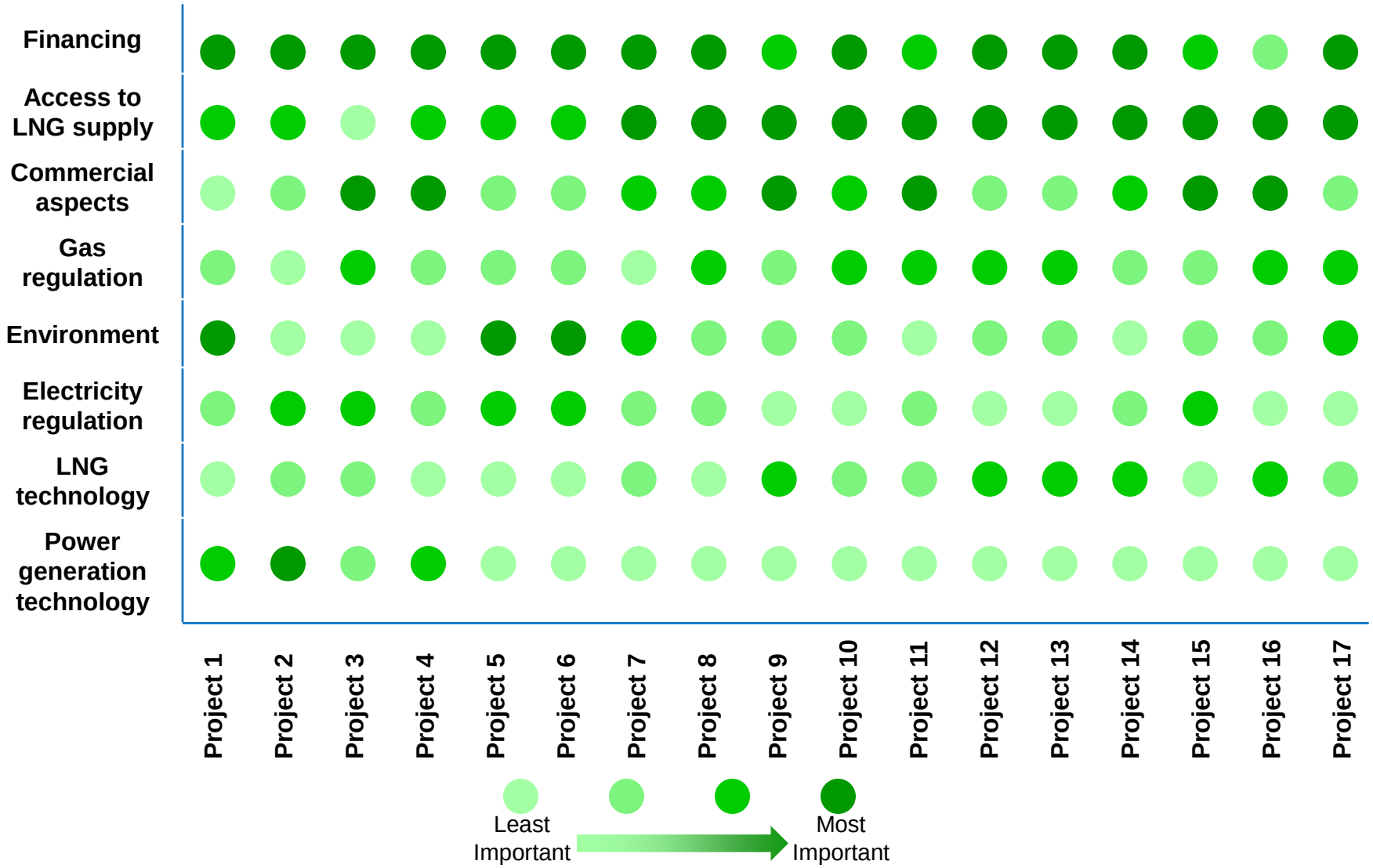
Fixed costs	Variable costs
Amortization	Fuel
Financial costs	Emissions (CO_2)
Fixed taxes and fees	Income Tax
Fixed Operation and Maintenance	Variable Operation and Maintenance



4 LNG market



5 Business challenges



5 Wrap up

- **LNG is available only to those able to compete with worldwide LNG demand**
- **LNG price is a significant issue. Economic models ought to estimate if LNG will be competitive if introduced in an existing power market**
- **Project sponsors must overcome many uncertainties. Risk mitigation is mandatory, both for the power generation business as well as for the LNG supply business**

If you want different results, do not do the same things.

- Albert Einstein -

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Thank you for your kind attention

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