

RUNNING ON EMPTY

Implications of declining natural gas reserves and other key trends on the Thai power sector

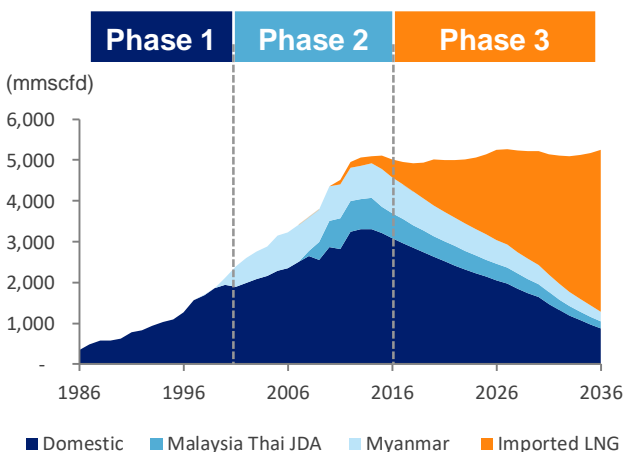
UNPRECEDENTED THREATS AND OPPORTUNITIES

Thailand has long depended on piped natural gas, from domestic and regional sources, to provide most of the nation's power supply, fuel economic growth, and keep prices stable.

With domestic and regional reserves rapidly depleting, Thailand is in the midst of a shift toward imported LNG becoming its primary fuel for power.

A dramatic increase in LNG exposure combined with global energy dynamics, emerging technology, and shifting regulations will bring unprecedented threats and opportunities to the Thai power sector and its participants.

THAILAND'S THIRD AND FINAL GAS INDUSTRY PHASE



Phase 1	Domestic gas drives industrial growth
Phase 2	Imports offset waning resources
Phase 3	LNG becomes primary source of gas

RUNNING ON EMPTY: A MULTI-CLIENT STUDY

AWR Lloyd and Pöry Energy have designed a multi-client study plan to enable stakeholders in the Thai energy sector to understand the impact of these issues.

- *Running on Empty* provides an integrated package of unique insights, tools, and decision support that participants in the Thai energy industry can use to manage change.
- Multi-client structure enables the creation of a large, powerful body of analysis and conclusions that is accessible and affordable to a broad range of market participants.
- AWR Lloyd and Pöry Energy are ideally positioned to deliver this study, with years of complimentary experience in the Thai gas, power, and renewable energy sectors and two existing market models on Thai gas and power.
- Two participation levels are offered to match the needs of different clients.
- The study will be delivered in a set of workshops, reports, and datasets organized in three modules.

Module 1
Thai gas deficit

Module 2
Impact on Thai power sector

Module 3
Results and conclusions

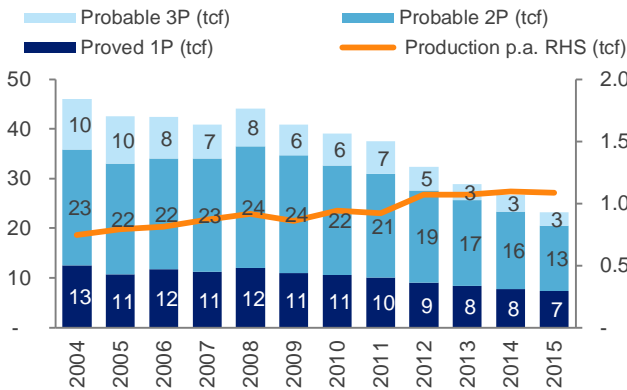


Thai energy sector in flux

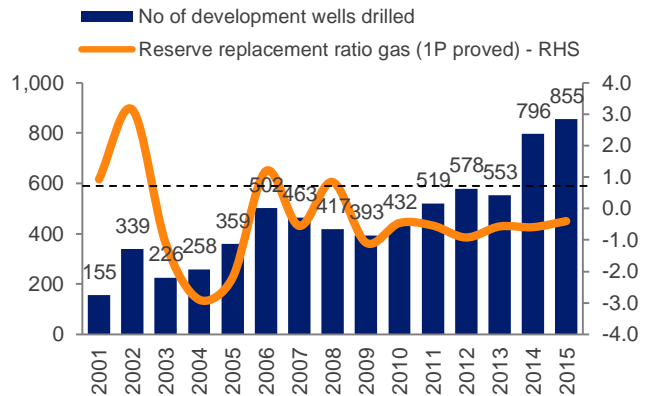
LNG dependency one of several factors

PIPED GAS SUPPLIES IN PERMANENT DECLINE

Thailand Natural Gas Reserves vs. Production



Development Wells Drilled



MAJOR ISSUES DRIVING SECTOR CHANGE

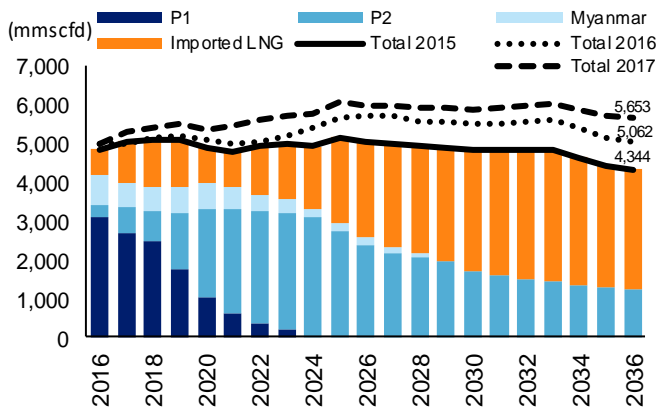
Although the shift to dependency on imported LNG is the most obvious driver of Thai power market change, the sector faces pressure on numerous fronts.

LNG dependency	Exposure to global market prices, changes in structure, new buyers and sellers
Technology change	Increasing competitiveness of renewable energy, batteries, electric vehicles and others
Global dynamics	Global gas supply & demand, hydraulic fracturing, and oil demand destruction
Regulatory issues	Large number of new policies & changes across upstream gas, midstream & power sector

To date, Thailand's LNG exposure has been buffered by low prices and modest import volumes. Going forward, as Thailand's reliance on imported LNG increases exponentially, numerous threats will emerge.

LARGE DEPENDENCY IS THE BASE CASE

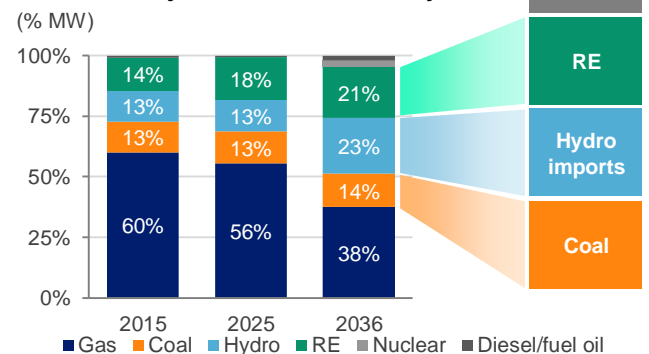
Thailand Natural Gas Supply Plan



FEW OPTIONS FOR THE THAI POWER SECTOR

Thailand plans to increase its reliance on coal and imported hydro power. However, these options are constrained, leaving renewable energy and LNG as the only unlimited resources. Failure to meet efficiency goals means more demand.

PDP2015: Projected Power Source by Fuel



Need for the multi-client study

Targeted analysis for better decision-making

The scale of the change facing the Thai power sector requires a in-depth and practical understanding. Running on Empty's multi-client structure enables the creation of a large, powerful body of analysis that is accessible to a broad range of market participants.

Running on Empty draws on a vast set of experience, expertise and knowledge across AWR Lloyd and Pöyry Energy, as well as market models for Thai gas supply, LNG and electricity.

The study will package analysis and conclusions in the form of three reports delivered in a series of modules. This is intended to serve as expertise in a box – delivering a rare depth of analysis to clients.

Qualitative analysis

Comprehensive overview and analysis of all major factors driving Thai energy sector by packaging years of experience with research and interviews

Quantitative analysis

Data-rich analysis & tested in-house market models

- Thai natural gas supply model
- Thai Power Sector model

Actionable outputs and conclusions

Carefully designed set of results, outputs, scenarios, and conclusions targeted to needs of participants and packaged in an easily accessible format

1 LNG dependency threatens Thai price stability

2 Energy technology could be transformative

3 Global energy changes will impact Thailand

4 The government's responses will be crucial

The Thai power industry has benefitted greatly from the stability provided by piped gas with price buffers – increased reliance on LNG shakes this up

Continued evolution and improvement in technologies such as solar, storage, and EVs could bring Thailand tremendous benefit – but as with all transitions, there will be both winners and losers

Thailand will increasingly be impacted by global issues, including geopolitical conflicts, global environmental considerations, and general energy market dynamics

The government has set forth a variety of plans and programs to enable Thailand's energy evolution, but are they appropriate and achievable?

Key questions



- Can Thailand meet PDP 2015 goals?
- What will imported LNG dependency mean?



- What will be the outcome of a wide range of important regulatory issues?



- How will this impact the power sector?
- What are the implications?



- What global forces will impact Thailand?
- What impact will technology have?



- Will LNG costs drive an RE boom?
- What would that look like?



- Will retail tariffs have to change?
- Can Thailand pass LNG risk to consumers?



- What does this transformed market mean to generators?



- What areas might deliver profitable growth?
- What are the consequences for players?

Running on Empty: Study details

AWR Lloyd and Pöyry will begin the study in October 2017 and complete it by January 2017. The content will be delivered in three discrete modules. The study offers two membership levels: Steering Committee and Multi-Client. Steering Committee Membership will entail direct access to project direction and outputs.

Steering Committee Membership

- Module 1: Thailand gas supply and LNG report
- Module 2: Thailand power market report
- Module 3: Results and conclusions report
- Workshop: Energy storage investment analysis
- Databooks from each module
- Ability to meet as a group and with project team to influence study direction
- Direct confidential presentations of study outputs at each stage

Multi-Client Package

- Module 1: Thailand gas supply and LNG report
- Module 2: Thailand power market report
- Module 3: Results and conclusions report
- Workshop: Energy storage investment analysis



- AWR Lloyd is a strategy consulting and financial advisory firm that specializes in the energy, resources, and infrastructure sectors in the Asia-Pacific region
- Founded in 2000, the firm has worked with numerous Asian and global companies and investors to develop and implement strategy, M&A, investment structuring, and capital raising



- Pöyry is an international engineering consultancy with over 5,000 employees in 40 countries – including 50 years in Asia and 250 employees in Thailand
- The leading electricity market consultant in Europe, Pöyry has provided power market advisory services in SE Asia since 2011
- Power sector experience underpinned by deep technical expertise, with over 160 GW of power generation projects worldwide

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