



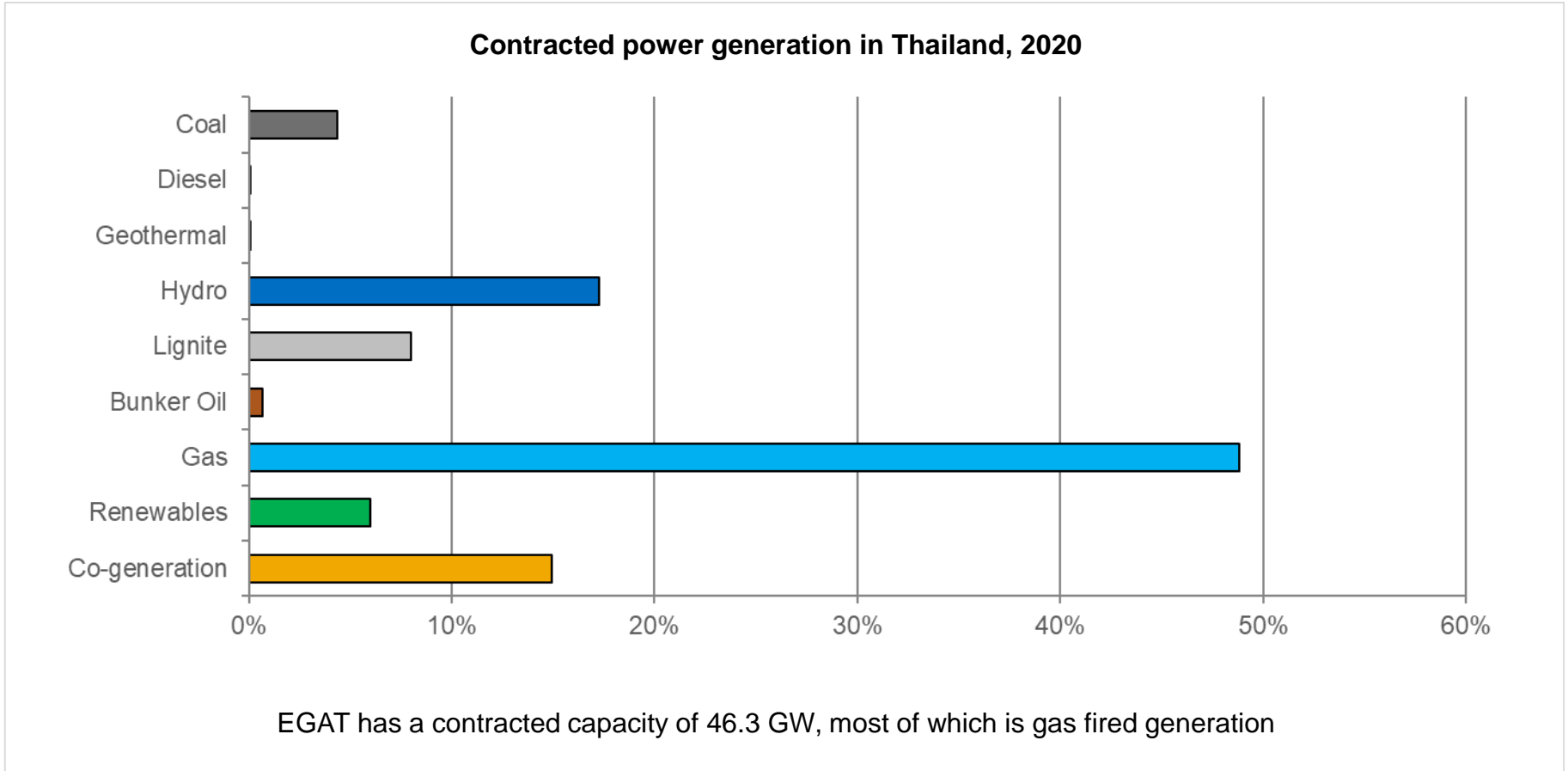
Contractual flexibility – The Thai experience

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- The results shown today are part of a study between EGAT and IEA on Thailand Power System Flexibility.
- The study has been completed with great thanks to EGAT for supplying detailed information on physical PPA's and fuel supply contracts that allow IEA to understand the specific issues of contractual flexibility in the system
- The study has been conducted within the context of the Thai electricity system
 - Enhanced single buyer system
 - Monopoly of gas supply
- Even though restructuring markets might bring even further efficiencies, it is not within the scope of this study, the study aims to provide clear actions to improve flexibility within the current market structure

Graph with key point



EGAT has a contracted capacity of 46.3 GW, most of which is gas fired generation

- The Thai system classifies its generation into
 - IPP(> 90 MW)
 - SPP (\leq 90 MW) – can be either firm or non-firm (if non-firm EGAT must take the generation)
 - VSPP (\leq 10 MW)
 - Import
 - EGAT

- IPPs are gas or coal

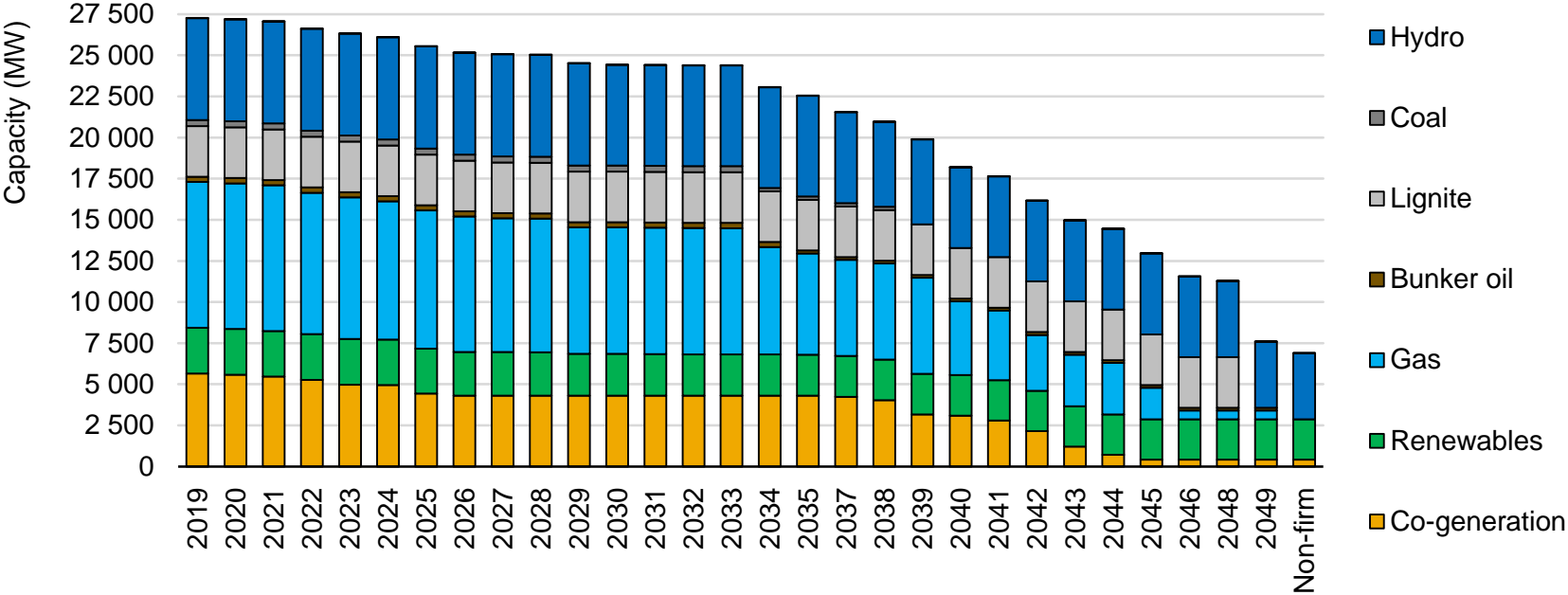
- SPPs are renewables or co-generation

- Imports are hydro or lignite

- EGAT own generation is hydro, lignite or gas

Evolution in contracts

Yearly evolution of minimum-take capacity in all contracts



Until 2034 the contracted capacity is relatively stable

Contractual commitments per technology

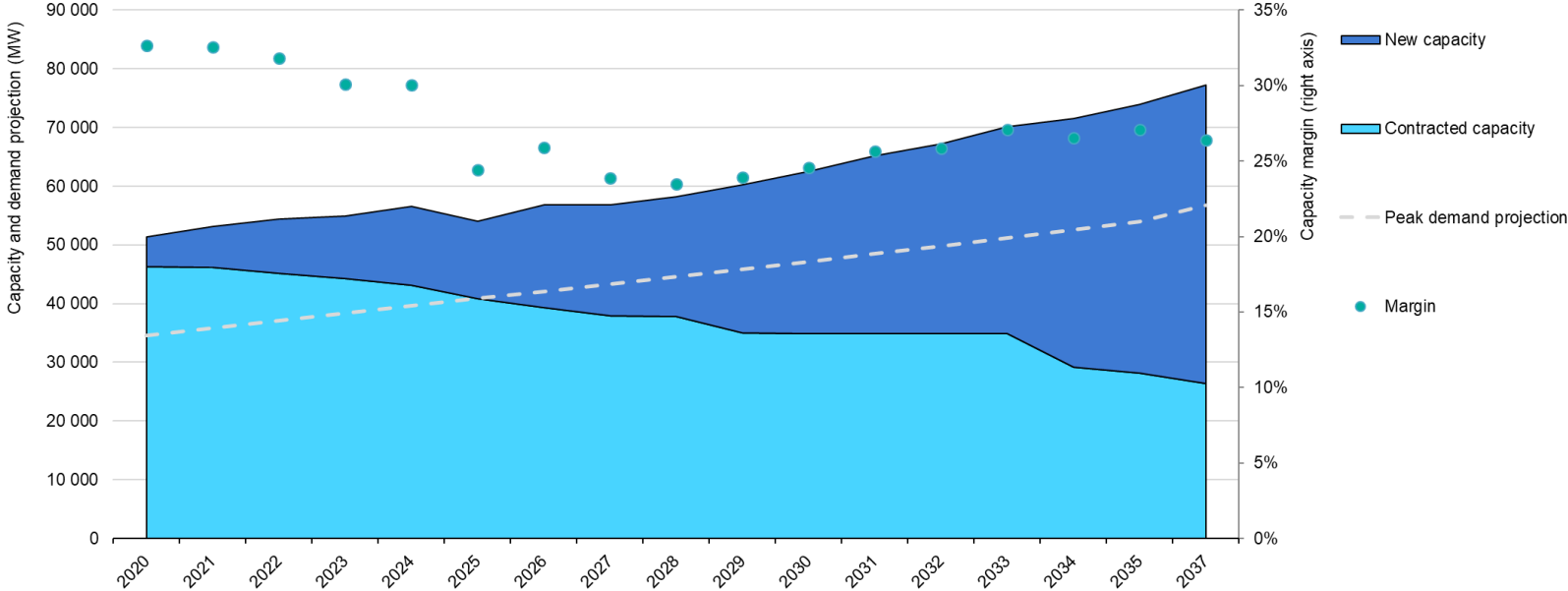
- In the contracts different technologies have different commitments

Technology	Minimum-take capacity
Cogeneration (firm)	100% (peak) and 65% (off-peak) of declared capacity
Cogeneration (non-firm)	100% of declared capacity
Renewables (firm and non-firm)	100% of declared capacity
Gas, bunker oil, lignite, coal, hydro (imports)	Minimum generation of declared capacity per unit
Geothermal	100% of declared capacity
Diesel	None
Hydro (EGAT)	100 % of declared capacity

Evolution in capacity margin and contracted capacity



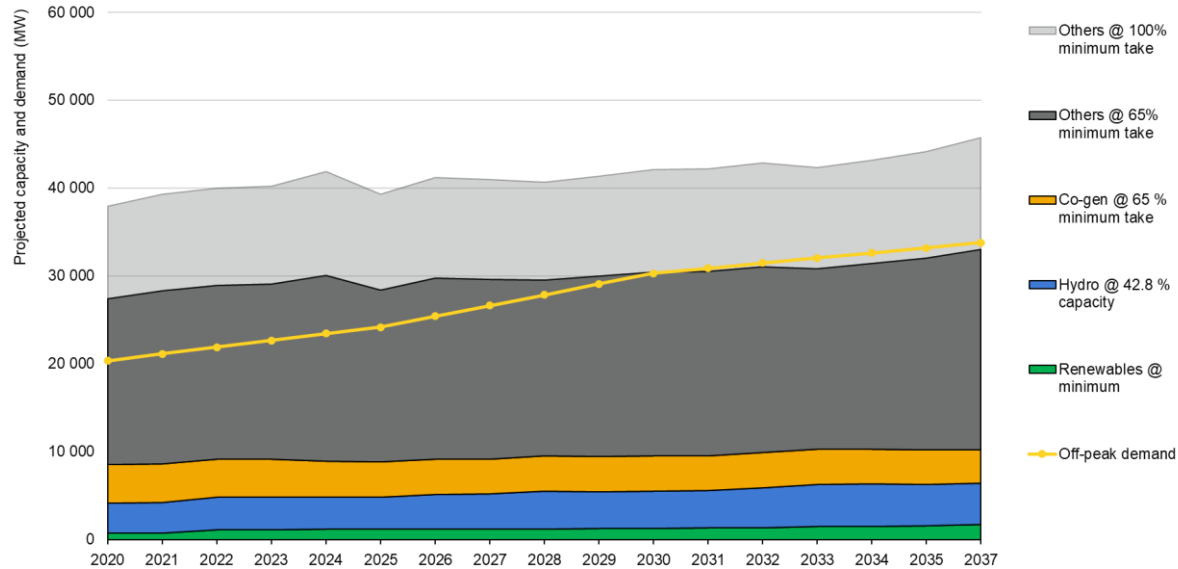
Capacity margin in the Thai power system, 2019 to 2037



EGAT will have a progressively higher share of new capacity, it's important that the new capacity does not negatively impact flexibility

Scenarios where contracted capacity affects flexibility

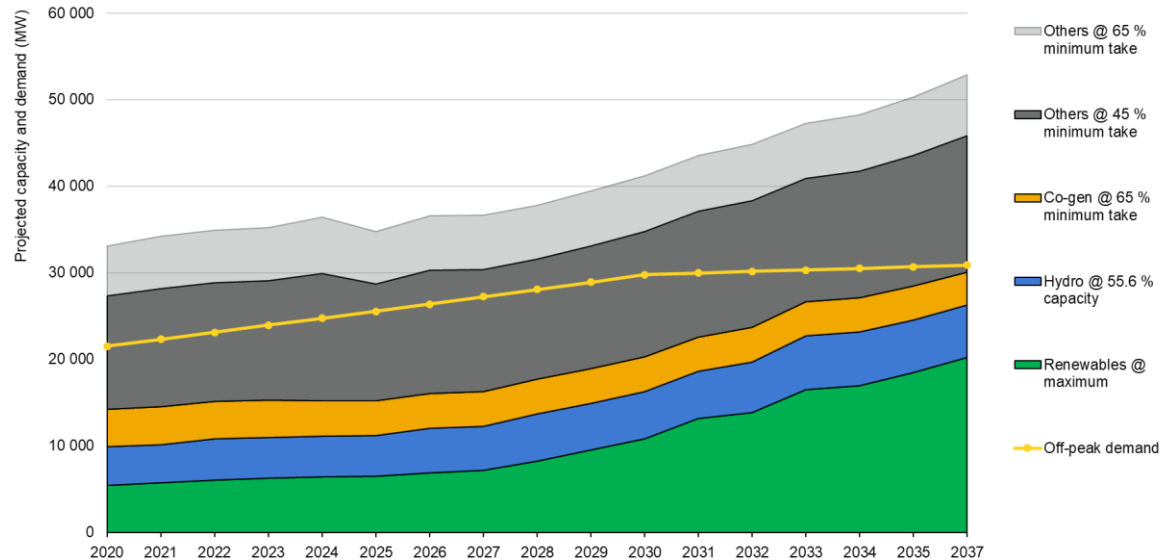
Scenario 2: Low renewables and off-peak demand



In the off-peak the contracted capacity is too high even if renewables produce at a very low level

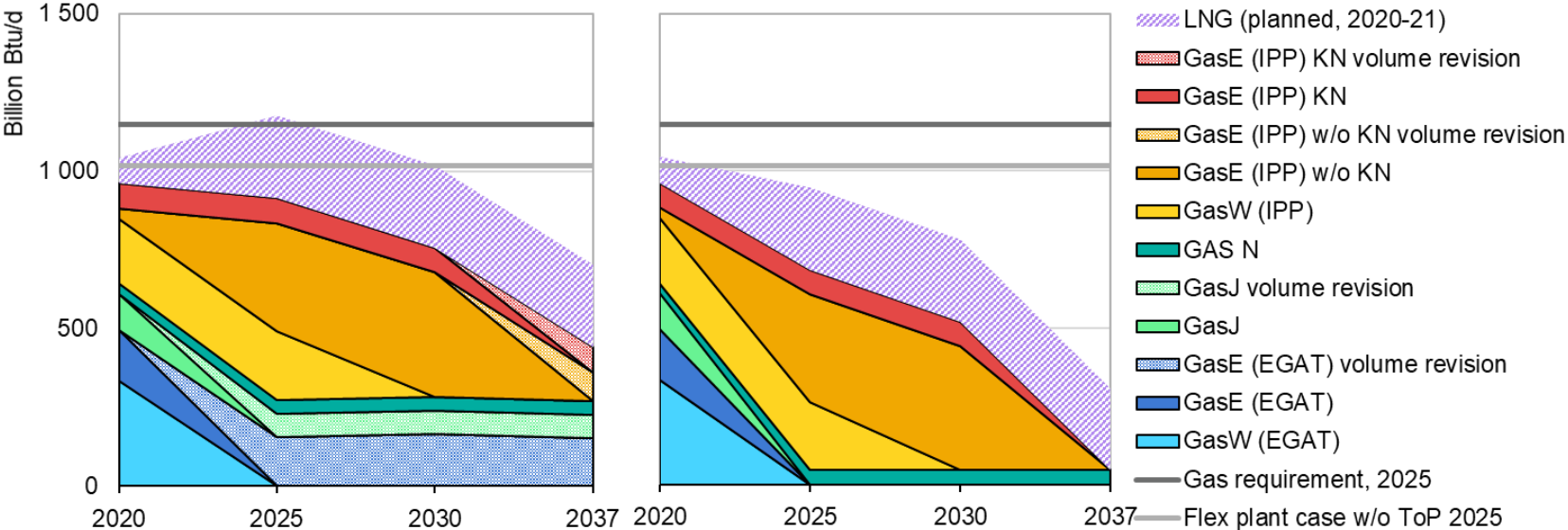
Scenarios where contracted capacity affects flexibility

Scenario 4: High renewables and off-peak demand



When renewables then produce the over contracting becomes even worse

Reduction of take-or-pay volumes



Currently daily take or pay volumes reduce flexibility of gas generation, in the future they should be reduced and a portfolio approach should be taken

- Continue engaging in the development of multilateral power trade in ASEAN, with the goal of achieving more flexible conditions for hydro imports.
- Consider separate negotiation of more flexible terms for hydro imports.
- Assess the need to renegotiate firm contracts with the aim of minimising EGAT's minimum-take obligations.
- Consider developing an auction mechanism for the renegotiation of firm contracts.
- Insist that new contracts have lower minimum-take obligations, if any, taking into account technical restrictions.
- Implement clear rules for VRE curtailment in PPAs.
- Increase flexibility in fuel supply contracts by investigating renegotiation of take-or-pay volumes.
- Develop a portfolio procurement strategy for fuel supply by mixing long- and short-term products to optimise the flexibility of gas fuel supply.

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