

Research Article

Gas Aggregation as a Regulatory Model to Promote Improved Security of Domestic Gas Supply

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Abstract

This paper analyzes the role that can be played by aggregation as a regulatory model for the effective structuring of a country's gas sector, with a focus on how aggregation has functioned and is and could be functioning, in certain countries.

Aggregation, in one form or another, has enjoyed a colorful history in the regulatory shaping of several gas sectors. It has been applied successfully to the definition of nascent gas sectors in Trinidad and Tobago and the United Kingdom. Aggregation has been applied, with varying degrees of success, to the re-regulation of gas sectors in Singapore, Ghana and Tanzania; it has been threatened to be applied in Israel and Indonesia; and it has almost certainly failed in Nigeria.

Aggregation is but one of a number of regulatory models that can be used to structure the gas sector within a country's wider economy, and is the particular focus of this paper. This paper recognizes that there is no single or preferred model for the optimum regulation of the gas sector within any particular country, and different countries could take different views as to what they believe to be the most suitable regulatory model for their own particular gas sectors. This paper also recognizes that neither is there anything as simple as an agreed menu of established regulatory models for gas sector structuring, from which an appropriate selection can be made.

Keywords: Regulation; Aggregation; Gas; Single buyer model

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مقالة بحثية

تجميع الغاز كنموذج تنظيمي لتحسين أمن إمدادات الغاز المحلية

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ملخص

تُسهّم هذه الدراسة في تحليل دور تجميع الغاز كنموذج تنظيمي لهيكله قطاع الغاز بشكل فعال في الدولة، وذلك مع التركيز على كيفية تأدية تجميع الغاز في بعض الدول. يتسم تجميع الغاز، بشكل أو بآخر، بتاريخ متنوع على صعيد تشكيل منظم للعديد من قطاعات الغاز. وقد طُبّق بشكل ناجح في تعريف قطاعات الغاز الناشئة في ترينداد وتوباغو والمملكة المتحدة. وقد تم تجميع الغاز، بدرجات متفاوتة من النجاح، في إعادة تنظيم قطاعات الغاز في سنغافورة وغانا وتنزانيا، كما هُدد أن يتم تجميع الغاز في إسرائيل واندونيسيا، ولم تتجح عملية تجميعه في نيجيريا. يُعد تجميع الغاز من النماذج التنظيمية التي يمكن استخدامها لهيكله قطاع الغاز ضمن اقتصاد الدولة، وترتكز هذه الدراسة بشكل خاص على ذلك. وتعتبر هذه الدراسة أنه لا يوجد نموذج واحد أو مفضل للتنظيم الأمثل لقطاع الغاز ضمن دولة معينة، وتختلف الدول من حيث اعتبار النموذج التنظيمي الأمثل لقطاع الغاز الخاص بها. كما تعتبر هذه الدراسة أنه لا يوجد قائمة بسيطة أو متفق عليها للنماذج المحددة لتنظيم هيكله قطاع الغاز، والتي يُمكن اختيار ما هو مناسب منها.

الكلمات المفتاحية: تنظيم، تجميع، الغاز، نموذج الشاري الواحد

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Introduction—Aggregation and How It Fits with Wider Gas Sector Regulation

This paper analyzes the role that can be played by the concept of aggregation as a regulatory model for the effective structuring of a country's gas sector, with a focus on how aggregation has functioned and is and could be functioning, in certain countries that have experimented with the aggregation concept.

Applying the simplest literal sense and in the context of the regulatory structuring of a gas sector, "aggregation" entails the imposition of some form of intermediary between gas suppliers and gas consumers and the consolidation of supply and/or demand in order to create critical mass within the market. This is a very basic explanation of the concept; the practical examples of the use of aggregation in certain countries, which are discussed further in this paper, will offer a greater explanation of what aggregation really means when it comes to gas sector regulation.

Before focusing on aggregation, it would be helpful to first consider the wider purpose of "regulation." Regulation refers to the manifestation of some form of governmental intervention in a particular industrial sector, through controlling or directing the activities of the sector's participants, to achieve a desired outcome or to mitigate a particular shortcoming. The customary rationale for the need for the regulation of a sector stems from the perceived failure of that sector to effectively regulate itself through the efforts of its participants. Because of this failure, a government feels compelled to intervene with certain corrective measures. These measures might be necessary for a variety of reasons, that could include: To protect consumer interests; to promote investment and economic growth; to make provisions for new market entrants as sector participants; to protect existing sector participants' economic interests; to ensure free and fair competition between all sector participants; to break down monopoly and oligopoly positions and to prevent dominant position abuses; and to provide greater clarity and certainty relating to the current and prospective operation of the sector.

Regulation, however well-intentioned it may be, is not an activity devoid of risk. Regulation could be used improperly in order to promote certain vested interests, and regulation could also result in certain unintended consequences, depending upon how it is effected. There could be an inhibition of natural business competitiveness because of regulation and regulation could operate as a disincentive to continued investment. The costs of doing business could be increased and the very presence of regulation inevitably opens the door to the risks of regulatory capture or regulatory failure.

Within any program of planned regulatory reform, before introducing new regulation or refining existing regulation, two questions must be asked:

- (1) What is the mischief complained of in the particular sector requiring regulation, and why does the current regulatory structure (if any) of the sector allow that mischief to subsist?
- (2) Which regulatory model is appropriate to cure the mischief complained of, and how would that model work?

One of the most common reasons for regulatory intervention into the gas sector of a country that relies on the use of gas for its domestic energy needs is to promote what is usually summarized as *security of supply*. That is, within a country's energy sector, the prevailing market conditions will facilitate the safe and uninterrupted delivery of gas volumes to be sufficient to meet the needs of all gas users (whether industrial or domestic consumers) at prices that are economically sustainable to suppliers and consumers alike.

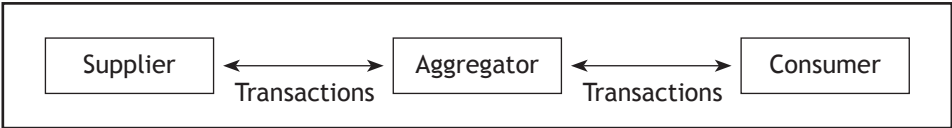
It could be that this security of supply objective is achieved naturally, as a product of the application of prevailing market forces. Alternatively, security of supply could be manufactured through some form of regulatory intervention. Such an intervention could be required where it is apparent that reliance upon the operation of market forces to provide security of supply would not be fruitful. Such an intervention might be needed, for example, where it is necessary to compel the diversion of a certain measure of gas for supply into a domestic market, rather than for such gas to be sold exclusively for export through a pipeline or as liquefied natural gas (LNG).

Gas sector regulatory interventions, in various forms, are commonplace and are generally regarded as being sometimes necessary (and temporary) on the road of transition to a freely functioning, competitive gas sector. Once the policy goal of security of supply has been realized, the regulatory intervention that delivered it could be abrogated if the supply of gas has become a naturally operative function of the market. Recognizing when this point of transition has come and breaking up a regulatory structure that could grow to benefit certain incumbents can be difficult to achieve, however.

Aggregation, the particular focus of this paper, is but one of a number of regulatory interventions that could be used to structure the gas sector within a country's wider economy. There is no single or preferred model for the optimum regulation of the gas sector within any particular country, and different countries take different views as to what they believe to be the most suitable regulatory model for their own particular gas sectors. Neither is there anything as simple as an agreed menu of established regulatory models for gas sector structuring, from which an appropriate selection can be made.¹ Aggregation is only one of the possible paths up the mountain. In an unrefined state that does not take account of the local conditions within which it exists, it is neither the best nor the worst possible regulatory option.

1. Aggregation—What Does It Actually Mean?

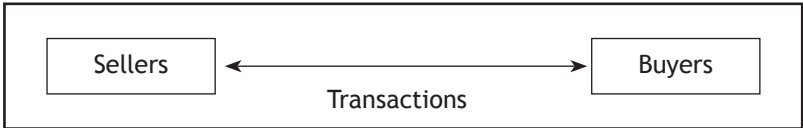
In the context of structuring a gas sector and in the simplest literal sense, aggregation entails the imposition of some form of intermediary between a gas supplier and a gas consumer, as a conduit through which the sale and purchase of gas between the supplier and the consumer is intended to flow.



Aggregation promotes the consolidation of supply and/or demand in order to create critical mass within a market, and it can take a number of different forms. Aggregation could be represented as a form of introductory brokerage between suppliers and consumers, or it could take the form of active market modelling and manipulation. There is no single way of illustrating the concept and in practice it has manifested itself in a number of gas sectors internationally in various guises. Aggregation could also come into existence for a number of different reasons, depending on the individual regulatory needs of the sector in which it is being applied. These various forms and reasons are considered further below.

Because of intervention into the functioning of a gas sector, aggregation is sometimes seen (unfairly) as an indication of failure in the natural development of that sector. Such a view assumes that the most perfect regulatory model and to which all gas sectors should aspire, is that which permits willing sellers and willing buyers to freely engage with each other for the sale and purchase of gas, without the interference of any form of intermediary. It will therefore be helpful to appreciate the role that aggregation can play in order to understand the paradigm of gas sector modeling which the willing seller/willing buyer model is widely assumed to be.

In the willing seller/willing buyer model, the supply of gas is an openly contestable activity, with freedom of contracting choice and the absence of intermediates in the basic commercial relationship.



¹ A useful indication of some of the possible options can be found in Andrej Juris, *The emergence of markets in the natural gas industry*, World Bank, Policy Research Working Paper No. 1895, March 1, 1998.

In this model the relationship between sellers and buyers is shaped predominantly by market forces and is characterized by the following principal features:

- (1) **Freedom of pricing**—The price payable by a buyer to a seller for the sale of gas is the product of open negotiation between the parties. A seller's natural commercial inclination will be to sell gas to whichever buyer is willing to pay the highest price (and not to sell gas at all where the seller believes that the economic recovery from doing so is inadequate).
- (2) **Freedom to contract**—A seller cannot be compelled to contract to sell gas to a buyer that the seller does not want to contract with. A seller might be unwilling to contract with a particular buyer because the proposed price is too low, because of concerns about any other commercial terms, or simply because of some antipathy toward the buyer.
- (3) **Freedom of contract terms**—The contract terms that apply between a buyer and a seller for the sale of gas will be those that are arrived at through open negotiation between the parties (except to the extent that the parties have agreed to rely, wholly or in part, on any industry-wide standard contract terms for the sale and purchase of gas).

The essential element of freedom of contracting, which characterizes this regulatory model, also creates the model's principal drawback: because a seller is not obliged to sell gas to a buyer, whether at a price that it regards as being inadequate or for any other reason, then there might exist a buyer that is denied the opportunity to buy gas from a seller (and possibly even from all sellers). The free application of market forces, which is consistent with the very nature of this model, could inhibit the natural growth of the sector.

The willing seller/willing buyer model requires a mature, well-populated, transparent sector for its most effective operation. The United Kingdom is often held out by regulatory economists as the exemplar of a "perfect" gas sector that reflects the practical operation of this model. In the United Kingdom today gas is bought and sold, at both wholesale and consumer levels, between willing sellers and willing buyers on commercially agreed prices, without the interference of any form of aggregation and often using published contract forms. State intervention is relatively minimal, the licensing of sector participants is done transparently, there are relatively low barriers to market entry, and third-party access principles facilitate opportunities for greater participation. General competition law principles and truly independent sector regulation also exist to underpin fair dealing and to prevent the establishment of positions of dominance and the risk of market manipulation. The United Kingdom has a gas sector that self-regulates and defines itself by the free and fair competition it openly encourages.

The transition to the willing seller/willing buyer model in economies that have historically applied more interventionist gas supply structures has also been a feature of European Union gas sector regulatory policies over the last twenty years (with, for example, the transition to the model being made as part of the emergence of a fully contestable gas supply sector in Denmark (2004) and Bulgaria (2007)).¹

In Israel a willing seller/willing buyer model has applied to date for the consumption of indigenous offshore gas production, with large industrial gas consumers and power generation companies contracting directly with gas suppliers for long-term supplies of gas. The price of gas and the form of the contract used, is freely negotiated between sellers and buyers. Some concern has been expressed, however, that an oligopoly is effectively being operated by the limited number of gas suppliers who together control the upstream gas market, with the consequence of consumers paying prices for gas higher than the prices that might be paid if there were greater competition among upstream

¹ See, for example, <http://ec.europa.eu/energy/en/news/energy-union-track-deliver>.

suppliers.¹ One suggested solution to this perceived problem is the introduction of a gas aggregator, which would regulate the price of gas going into the downstream by being the sole buyer and sole seller of upstream gas production. This, paradoxically, would be an example of a gas sector moving away from the perceived paradigm in order to provide what is hoped to be a more efficient economic solution.

More recent developments in the Israeli gas sector, notably in the form of suggested gas exports by pipeline to Egypt and Jordan, could further serve to distinguish the Israeli gas market between domestic and export consumers and could offer fresh impetus to calls for domestic market gas aggregation.

2. The Possible Reasons for Introducing Aggregation and the Possible Problems with Doing So

Aggregation should not be regarded as an objective in its own right, which could be brought into existence by the regulator of a gas sector simply because it applies and even appears to have worked, in some other gas sectors. Rather, aggregation should be considered only as a means of introducing, or supporting the growth of a successful gas sector.

A number of possible operational deficiencies might be identified in respect to a particular gas sector (regardless of whether the sector is nascent, or is already established and perceived to be performing poorly) for which the introduction of some form of aggregation has sometimes (rightly or wrongly) been suggested as a potential remedy. This list of deficiencies would normally include some or all of the following (together with, in each case, any indication of how aggregation might be of assistance in delivering effective sectoral reform):

- (1) **Lack of essential gas infrastructure**—It may be that within a particular country the amount of gas transmission, distribution and storage infrastructure in existence at any particular time is insufficient to allow for the development of a gas-based national energy economy capable of bringing the benefits of gas consumption to all domestic and industrial consumers, regardless of geography. As a vicious circle, a lack of infrastructure to deliver gas to consumers offers little incentive for suppliers to sell gas and an absence of gas sales commitments obviates the need to invest in the development of such infrastructure. A government might lack the financial resources to develop that infrastructure itself and the potential returns to be earned by private sector investors might be insufficiently attractive for them to wish to do so. Deadlock ensues. The introduction of a new entity that is able (or even obliged) to apply the financial returns it enjoys from occupying its position as an aggregator toward the development of new gas infrastructure could be the catalyst for new infrastructure investment and market growth.
- (2) **Imbalances of bargaining power**—It could be that gas is sold to consumers by suppliers who hold an unfairly disproportionate degree of bargaining power, such that those suppliers are able to command the commercial terms (both price and non-price) of their choosing and even to decide to whom they choose not to sell gas, however capricious the reason for not doing so might be. This risk can also apply the other way too, with consumers holding the balance of power over suppliers. The application of general principles of competition law (which could preclude market fixing and the abuse of positions of dominance) could simply be too slow and cumbersome to offer any sort of practical solution to an affected party. The introduction of a new entity that consolidates the requirements of all consumers, or of all suppliers, through the introduction of an aggregation function could make the process of negotiating terms for the sale and purchase of gas fairer, more balanced and more efficient among the intended sector participants.

¹ See, for example, <http://www.haaretz.com/israel-news/business/1.670907>. See also http://www.rand.org/content/dam/rand/pubs/technical_reports/2009/RAND_TR747.pdf.

- (3) ***Distorted gas flows***—Suppliers will naturally gravitate toward selling their gas to consumers who can offer to pay the highest prices. This could result in the direction of indigenous gas production to export markets or, within a country, only to those consumers who can afford to pay the higher prices.¹ In either case gas production simply might not be penetrating the domestic gas sector (evenly or at all). The introduction of a regulatory requirement that a certain proportion of domestic gas production must be channeled through an entity that performs an aggregation function could result in gas being available for sale, purchase, and consumption within the country and could result in a fairer distribution of gas to different groups of consumers.
- (4) ***Marginalization of new gas discoveries***—The point made above about suppliers being inclined to sell their gas production to the highest paying consumers supposes that the suppliers will actually want to produce gas in the first place. It may be that a supplier that has made a discovery of gas views that discovery as not being worthy of a declaration of commerciality if there is any combination of a lack of realizable access to export markets and poor prospects for selling gas to domestic consumers who can offer comfort that they will pay attractive prices for that gas. This could lead to the creation of stranded gas deposits within the country's patrimony and stasis in the proper exploitation of the country's mineral wealth. The introduction of an aggregation model could give impetus to the promotion of gas discoveries, by giving greater certainty regarding the potential consumer universe and the commercial terms on the offer for the sale and purchase of gas.
- (5) ***Imbalanced realized gas prices***—Because in certain countries certain consumers of gas can afford to pay higher prices for that gas than other consumers, those consumers who can only afford to pay low gas prices will not be the natural customer of choice for suppliers and these consumers could be effectively excluded from the ability to participate in the growth of a gas sector. A mechanism could be needed whereby the gas prices that can be paid to suppliers from certain consumers are higher, or whereby all gas prices that are payable are harmonized, in order to encourage suppliers to sell their gas more widely. The introduction of some form of price consolidation through an entity as part of the performance of a wider aggregation function could apply such a mechanism (although this approach is not without its own attendant problems; see below).
- (6) ***Payment failure and credit risk***—Poor payment history on the part of existing consumers, and an inability to secure reliable credible support to underpin the payment obligations of those consumers (which in turn could be a consequence of the poor payment history they offer) are often endemic features within a developing gas sector. This gives suppliers a further disincentive to want to supply gas to those consumers, which in turn further inhibits the development of the sector. If an aggregator is appointed to act as principal in the buy-side and sell-side relationships, then suppliers will shift the payment risk to the aggregator as the buyer, which could be a more attractive proposition for them (although this benefit is not realized if the aggregator acts only as a broker between suppliers and consumers and does not intermediate itself in that relationship as a fully contracted principal).
- (7) ***Unnecessary gas contracting complexity***—The contracts required for the sale and purchase of gas between suppliers and consumers could be realized piecemeal on a transaction-specific basis. Those contracts could be relatively complex and the negotiation of them could be expensive, time

¹ A particular example of this to note is the position occupied in certain energy economies by electric power generators. The amounts they can afford to pay for gas as a feedstock for power generation could be a direct netback from the prevailing prices which they in turn are paid for generated power. It is axiomatic that low power prices will lead to low gas prices. Alternatively, industrial manufacturers and petrochemical producers could generate comparably better returns from their business activities, and they could be able to pay comparably higher prices for gas. This has, for example, been the case in Nigeria (see <http://www.worldbank.org/en/news/press-release/2013/04/22/world-bank-to-help-nigeria-improve-gas-supply-and-reliability-and-bring-more-electricity-to-nigerian-consumers> and <http://documents.worldbank.org/curated/en/684961468197340692/pdf/101751-WP-P151987-Box393265B-PUBLIC-Nigeria-Economic-Report-2015-web-version.pdf>).

consuming and sometimes futile. Because of the high number of contracts to which an aggregator could be party, and because of the aggregator's natural desire for consistency in the application of those contracts, an aggregator could develop and apply relatively standard contract terms for the sale and purchase of gas to the parties on both sides of the aggregation function. This could speed up transaction times and reduce contracting complexities and costs.

- (8) **Imperfect regulatory control**—There could be a concern on the part of a government that inadequate regulatory control is being exercised over certain aspects of a gas sector. This inadequacy could be a consequence of any combination of poorly applied existing regulatory functions, regulatory capture, or pseudo-regulation by certain sector participants. The imposition of an aggregator with clear responsibility for the regulation of the activities of the sector in which it is active could provide a greater measure of regulatory certainty (although this could also be seen as a poor substitute for the simpler expedient of taking firmer control of the existing regulatory situation).

As a regulatory model, aggregation can be used to address many of the operational deficiencies identified above, but the model is not without its own attendant pitfalls and problems:

- (1) **Complexity**—Aggregation introduces an additional layer of administration, cost and complexity into what could otherwise be represented by a relatively simple set of bilateral gas sale and purchase arrangements in the willing seller/willing buyer model (assuming of course that such a model could be readily applied into a gas sector, which is not always the case).
- (2) **Anti-competitiveness**—Aggregation is sometimes regarded as being inherently anti-competitive because of the high degree of market intervention it represents. Aggregation is also sometimes seen as a model that hinders the effective development of a truly contestable gas sector (although this could simply be an issue of timing, depending upon how long gas aggregation is intended to be implemented within a gas sector as part of a transitional structure to a different outcome).
- (3) **Risk of manipulation**—An aggregator could be exposed to the risk of manipulation by industry participants who might seek to take control of the aggregation function and apply it to serve their own commercial needs (although the extent to which this sort of regulatory capture is a real risk depends on how the ownership, operation, funding and management structures of the aggregator are effected in practice). Aggregation might not be a popular option and the regulatory intention behind it could be defeated by the action or inaction of some sector participants.
- (4) **Quasi-regulation**—An aggregator could (whether intentionally or not) exercise a quasi-regulatory function, which confuses the regulatory landscape and usurps the real gas sector regulator's functions (although this risk could be mitigated by clear and effective sector regulation and indeed this feature could be intended as a requirement of the aggregation function).
- (5) **Improper application**—An aggregator could exercise its responsibilities improperly and to the detriment of the development of the sector, such as through how the aggregator elects to match up supplier and consumer opportunities and the determinations the aggregator makes relating to suitability to contract (although this risk could be mitigated by clear operational principles regarding the functioning of the aggregator and by the right of an aggrieved person to appeal to a truly independent sector regulator in order to arbitrate any differences).
- (6) **Improper selection**—The wrong form of aggregation could be selected and applied within a particular gas sector (or the right form of aggregation could be selected but could be wrongly applied). It may be, for example, that aggregation with price consolidation (see below) is a critical requirement, but it is not applied within the aggregation model. This could lead to a failure of the intended aggregation function, and to an unfair general assumption that aggregation does not work.

3. The Structural Options for Introducing Aggregation

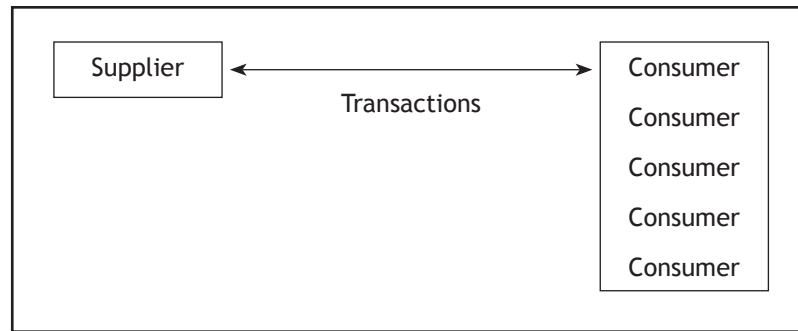
Aggregation can take a number of different forms and there is no single way of illustrating or realizing the concept. Nor will any single version of what might be regarded as a form of aggregation necessarily eliminate all of the structural deficiencies identified above.

The following examples indicate how aggregation, in some form or other, has manifested itself in practice in the structuring of certain gas sectors to date:

(1) *Block purchasing/block selling*

Aggregation can be seen in a structure whereby a group of market participants consolidate their commercial activities so that they have a stronger collective negotiating position.

In sell-side gas aggregation¹ a number of small gas suppliers could band together to sell their gas en bloc, acting as a single seller, to a consumer. That consumer could be a state agency or a significant consumer that enjoys monopsony buying power. The economic theory behind this aggregation is that the suppliers will have a stronger negotiating position (for price and other commercial terms) against the consumer if they act in unison through such aggregation.



Correspondingly, in buy-side gas aggregation² a number of small gas consumers could band together to buy their gas en bloc, acting as a single buyer, from a supplier. That supplier could be a state agency or a significant producer that enjoys monopoly selling power. The economic theory behind this aggregation is that the consumers will have a stronger negotiating position (for price and other commercial terms) against the supplier if they act in unison through such aggregation.

Such aggregation, whether sell-side or buy-side, usually happens naturally as a relatively localized commercial activity within a given gas market and as the needs of the market participants dictate.

(2) *Aggregation through a buy/sell principal*

In this aggregation structure, an intermediary will buy gas as a principal from a supplier and will sell gas as a principal to a consumer, sitting between the ultimate seller and the ultimate buyer. This activity could be repeated with many different principals on either side, thereby constituting that intermediary as an aggregator of a number of sell-side and buy-side gas trades. This form of aggregation is sometimes known as the “single buyer” model for obvious structural reasons.

A supplier might prefer the idea of selling large volumes of gas to a single buyer that has taken the risk of aggregating fragmented downstream demand, compared to the idea of entering into a multiplicity of contracts to sell gas to multiple downstream consumers.

1 See <http://www.westtexasgas.com/other-businesses/wtg-gas-marketing/> for an example of sell-side gas aggregation into a local energy market.

2 See <http://www.puco.ohio.gov/puco/be-informed/consumer-topics/governmental-energy-aggregation-local-community-buying-power/#sthash.9Yxa3Qo5.dpbs> for an example of buy-side gas aggregation into a local energy market.

The aggregator would take the risk of non-payment from its sale-side supplier counterparts (as well as the responsibility for securing adequate credit support in respect of their payment obligations), would take the risk of performance failure from its buy-side consumer counterparts and would assume all of the scheduling, matching and working capital management risks inherent in performing such a pivotal role between both sides of the market.

This is a highly involved form of aggregation and it could be accompanied by the statutory grant of a position of market exclusivity in favor of such an aggregator.

The buy/sell principal model has the apparent advantages of applying structural simplicity (through avoiding the need for a multiplicity of bilateral contracts), creating economic advantage (because the aggregator takes the risk of non-payment from downstream consumers) and of bringing an overall economy of scale to a gas sector, but the model could also be seen as a vehicle for the promotion of vested interests in a sector where the need for model is not obviously apparent.

The aggregator inevitably has transaction costs associated with the performance of its function. These costs are typically met through exploiting the positive margin generated by buying gas for x and selling gas for $x+$. The aggregator could generate significant profits from the arbitrage position it enjoys. The sector regulator might be required to control these profits in order to protect the development of the sector.

The aggregator could have significant working capital commitments (depending upon how the timings of the purchase commitments and sales receipts are structured). If the aggregator is not inherently creditworthy in its own regard, then some degree of state support might be needed. This ultimately confers upon the state the economic incidence of the model, which undermines the very purpose of introducing the regulatory model.

Examples of the use of aggregation through a buy/sell principal model to regulate a gas sector include the following:

The United Kingdom

The British Gas Corporation (BGC) is a prime (albeit now historical) example of such an aggregator. The BGC came into existence as the beneficiary of a statutorily created entitlement to be the exclusive participant in the United Kingdom gas sector for the performance of its functions. The primary intention was to facilitate the economic engineering of the United Kingdom gas sector in a way as to fund key gas transportation infrastructure development without governmental involvement.

The first discoveries of commercially recoverable quantities of offshore gas in the United Kingdom were made in the mid-1960s by several independent oil companies holding government-granted licenses for petroleum exploration and production. As more offshore gas production emerged in the early 1970s, it became a requirement that all offshore gas production be sold to BGC. This was a statutorily constituted monopsony established by the Gas Act 1972, with BGC having exclusive rights to buy gas production at such prices and on such terms as it required. BGC then sold the produced gas to domestic and industrial buyers, acting as a monopoly seller.

As part of its mandate the BGC had the exclusive right and responsibility to develop, own and operate the national gas grid. Known today as the National Transmission System (NTS), the national gas grid was the network of transmission and distribution pipelines that transported gas across the United Kingdom, from the points where it came ashore to the various points of consumption. This process did not start with BGC, because BGC inherited a series of localized gas pipelines when it came into existence, but BGC applied consistency to the effort to develop a national gas grid and became the driving force behind the NTS as it appears today. The significant stipend which was

afforded to BGC through the position of exclusivity it enjoyed in the bulk purchase and resale of gas production enabled BGC to fund infrastructure development.

Trinidad and Tobago

The buy/sell principal model is in use today in Trinidad and Tobago, where the National Gas Company (NGC) is the sole seller and buyer of gas and effects the arbitrage between upstream production and downstream demand.¹

Originally formed in 1975 and with what it openly calls “unparalleled state-led involvement in natural gas development,” NGC was mandated to participate in gas commercialization ventures to enhance the value of gas and was made the sole local distributor of gas. NGC’s objective was to establish and attract gas-based industries, to negotiate long-term natural gas contracts (and prices) with suppliers and consumers and to develop and manage the country’s gas transmission system. The building of gas transmission infrastructure by NGC in particular was seen by oil companies as an incentive to produce gas, as the presence of such infrastructure led to the promotion of a local market for gas commercialization.

The role of NGC as the sole buyer and seller of all gas produced within Trinidad and Tobago, as the principal gas transmission company that owns and operates a network of onshore and offshore gas transmission lines and which enjoys a monopoly position as a strategically placed midstream operator with strong linkages to upstream and downstream activities, has been instrumental in commercializing relatively modest amounts of indigenous gas and making a major contribution to the country’s economic growth.

More recently, the Trinidadian government has discussed the possibility of setting up a subsidiary company that would receive and aggregate upstream gas production for further allocation between domestic and export needs.²

Singapore

In Singapore, demand for gas (as a feedstock for petrochemical production and power generation) had been increasing in the early 2000s and the ability to meet that demand from existing import pipeline gas supplies was looking increasingly less certain. Liberalization of the gas and power markets in Singapore also led to the emergence of new market entrants as gas buyers, keen to secure reliable supplies of gas in order to develop their projects. LNG imports were identified by the Singapore government as a means of meeting the changing demand profile. The problem faced by the Singapore government was one of matching the demands of a number of downstream gas buyers, with fragmented demand patterns and uncertain timing requirements, with the prospect of a long-term, secure supply of LNG.

The proposed solution was the introduction of an exclusive gas aggregator (but solely for LNG imports—several preexisting gas pipeline import projects continued to enjoy autonomy and the ability to sell gas directly into the market). In 2008 BG Singapore Gas Marketing Pte Ltd (now Shell Gas Marketing Pte Ltd) was appointed by the Singapore Energy Marketing Authority (EMA) as the exclusive aggregator for the first three million tonnes per annum of LNG demand, for a fifteen-year franchise term. The aggregator was intended to handle the interface between multiple downstream gas buyers and upstream LNG suppliers, as the sole buyer of LNG into Singapore and the sole seller of regasified LNG to downstream gas buyers.³

In this model the aggregator takes credit risk on downstream gas buyers because the upstream

1 See <http://ngc.co.tt/>.

2 www.offshore-technology.com/comment/lng-demand-incentives-development-trinidads-natural-gas-discoveries.

3 See www.ema.gov.sg/Shell_Gas_Marketing_Pte_Ltd.aspx.

payment obligations of the aggregator for the LNG supplied are not conditioned by the prior receipt of downstream gas payments by the aggregator. The aggregator is therefore keen to vet the payment covenant of prospective gas buyers wishing to participate in the aggregation model.

Aggregation has been noted for having made a significant contribution to meeting Singapore's gas security of supply challenges and offering a number of benefits.¹ The consolidation of downstream demand maximized buyer power while also allowing those buyers to meet their individual needs for gas, often with staggered project start-up timings, from a secure source of supply. Furthermore, having a single buyer of LNG at the import terminal simplified terminal usage and start-up operations.

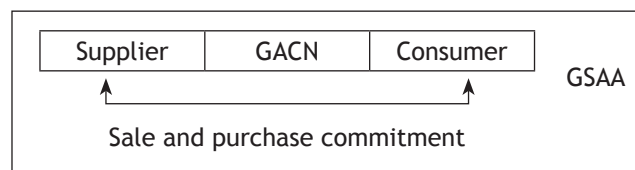
The Singapore aggregation model does have some perceived disadvantages too. There is no opportunity for a major prospective buyer of LNG in the downstream market to contract directly with LNG suppliers, so buyers could miss the opportunity to exploit a buyer-friendly LNG market. Despite the assertion that the model maximizes buyer power, the reality is that buyers have no real power when negotiating gas prices or other commercial terms with the aggregator, as they have no alternative sources of supply against which they can leverage their position.

(3) *Aggregation by brokerage*

In this aggregation structure, an intermediary mediates gas sale and purchase arrangements between suppliers and consumers but does not assume a direct contracting role in the relationship between them.

Nigeria has a gas sector in which the creation of an aggregator to compel the supply of gas into the domestic economy (for the benefit of the economy itself and to counteract the more attractive prospects for higher-priced exports of gas via pipeline or as LNG) has taken place but without the aggregator becoming involved as a buy/sell principal. This aggregator, a limited liability company called the Gas Aggregation Company of Nigeria (GACN), acts as a broker between suppliers and consumers who still contract directly with each other.²

To guarantee the presence of sufficient volumes of affordable gas to meet domestic demand, the Nigerian legal regime obliges suppliers to dedicate a defined percentage of their total gas production to the domestic market, under a domestic supply obligation (DSO). In contrast to the aggregation function performed by BGC described above, GACN performs a portfolio management role but does not contract as principal in the buying and selling of gas. Gas sales and aggregation agreements (GSAA) are made directly between sellers and buyers, with GACN appearing additionally as a party to the contract but only to effect the brokerage function.



GACN manages an escrow account into which buyers' payments for gas are deposited, but GACN does not act as the guarantor of a buyer's payment obligations. The escrow arrangement is intended to provide some security of payment in favor of a seller but not collateral support (although neither is it realistically expected that the aggregator will be relied upon to perform a true credit support

1 For more on developments in Singapore, see Paul Turner & Anthony Barker, *Singapore—Emergence of a new LNG market and the role of the aggregator* (http://www.gastechnology.org/Training/Documents/LNG17-proceedings/1-1-Anthony_Barker.pdf). See also https://www.ema.gov.sg/LNG_Procurement.aspx.

2 <http://www.gacn.com/about-us/>.

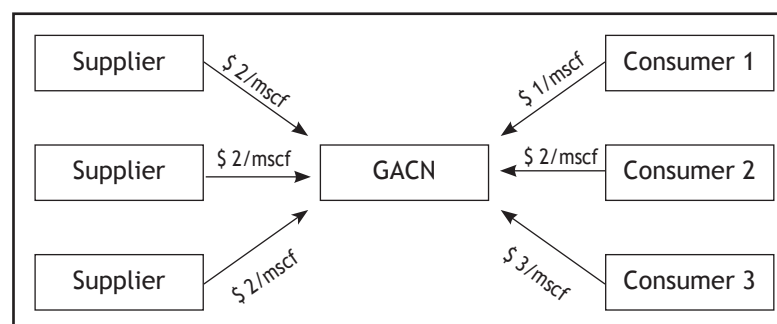
function in this model). Thus it is still imperative that there is a bankable gas sales relationship between the seller and the buyer, with the buyer's solvency at the heart of that relationship.

The introduction of gas aggregation in Nigeria has not been a smooth process. Much remains to be done and it cannot be said that the intended regulation has been successful. The Nigerian model of gas aggregation (and price consolidation; see below) has not functioned as effectively as hoped and the Nigerian gas sector has not developed in line with the expectations underpinning the advent of the model. Some ten years after its introduction, the business of aggregation is still not underway for a number of separate but related reasons. GACN has matched up certain sellers and buyers of gas, but the GSAAAs that have been signed are not unconditional and not guaranteed to perform. The DSO has not been applied consistently to all producers, the risks of poor payment continue, the market still lacks a clear and reliable gas pricing methodology and uncertainty persists about who is responsible for regulating the Nigerian gas sector. Stranded gas deposits (which the aggregation model was supposed to make commercial) remain stranded, associated gas continues to be flared and there is no confidence that future revenue streams from domestic gas production will ever be sufficient to justify making significant investments into gas production and transportation infrastructure. Bilateral gas sale and purchase arrangements, in which higher market prices earn greater security of supply, have continued to prevail, and buyers, who are incapable of paying a price for gas to open the door to such arrangements, have continued to suffer. In June, 2017, the Federal Government of Nigeria approved a new national gas policy, part of which emphasized a managed movement toward the willing seller/willing buyer model and away from the concept of gas aggregation, which almost certainly means the end of GACN.¹

(4) *Aggregation for price consolidation*

Aggregation could be applied to harmonize the prices paid for gas by consumers to suppliers, so that there is no longer an economic justification for suppliers to refuse to sell gas to consumers able only to pay lower prices for that gas.

Under the Nigerian gas aggregation model, a gas supplier is paid a single aggregated price for its gas, regardless of the identity of the consumer to whom the gas is sold. To effect this price consolidation, GACN takes all the sales prices payable by all the consumers (which could be different prices, depending on the sectors into which gas is being bought) and then remits a single, averaged price to all of the suppliers. The consumer pays the same price that it would otherwise have paid and sees no consequence of the price consolidation. All of the suppliers, however, receive a single, consolidated price.



This model of price consolidation recognizes that not all consumers can afford to pay the same (that is, the highest) price for gas and reduces the commercial incentive for a supplier to sell gas only to the highest-priced consumer within a particular market. This is intended to facilitate the flow of

¹ See www.templars-law.com/up-content/uploads/2017/07/THE-NATIONAL-GAS-POLICY2c-2017.pdf.

gas to sectors of the downstream gas market that are economically less attractive to suppliers, to consumers who otherwise would have no economic basis to interact. It allows those consumers to establish gas demand and dependency in their markets and to improve their economic position over time. This could be an essential part of the evolution of a truly contestable gas sector.

Price consolidation will be inherently distortive of true market economics because of the obvious subsidy it creates. Price consolidation provides a poor incentive to suppliers, who are exposed to receiving consolidated prices that are lower than actually realizable prices and thus reduces the natural inclination of those suppliers to want to develop gas projects and to supply gas into the market. It also gives a poor signal to consumers who enjoy the cross-subsidization that the consolidation affords them, because it gives them no incentive (for as long as consolidation exists in their favor) to want to improve their businesses so that they can pay something closer to true market prices for gas. Price consolidation could be an impediment to the emergence of a truly contestable market because suppliers are denied the prices they could otherwise achieve and because certain consumers are afforded access to gas supplies at prices they would not otherwise merit. Also, the single, consolidated price that is on offer to suppliers to compensate them for their gas sales usually makes no adjustment for the differing costs of gas production among different suppliers. Consequently, the lowest cost supplier makes the greatest return, and the highest cost supplier makes the lowest return. This could further disincentivize suppliers from undertaking new gas projects.

Aggregated gas sales with price consolidation could expose some suppliers to the receipt of an aggregated gas price that could be lower than the price payable under a bilateral (disaggregated) gas sales arrangement. This gives those suppliers an incentive to avoid aggregation in favor of pursuing sales under a bilateral arrangement, which they could seek to do by ensuring the aggregation arrangements remain ineffective for as long as possible, so that aggregation never comes into play. There is some suggestion that this has been happening in Nigeria.

(5) *Aggregation for governmental consolidation*

It could be that the creation of an aggregator enhances the degree of control that the government has over the gas sector. In such a case, the aggregator would effectively be functioning as the regulator of those aspects of the sector in which it is active (and the functioning of the regulator of the relationship between the aggregator, acting as a quasi-regulator and the actual appointed sector regulator would need to be made clear). The following are examples of countries where aggregation appears to have been promoted with the consequence of consolidating government influence (intentionally or not):

Indonesia

Indonesia signaled a move toward the introduction of a national gas aggregator with the issuance of a draft Presidential Regulation on natural gas management in 2015.¹ The principal objectives of this step appeared to be to ensure the availability of an adequate and uninterrupted supply of gas into the domestic sector (with the ancillary benefit of promoting the development of the upstream gas sector and the development of new sources of gas production), to promote the development of gas transmission and distribution infrastructure by pooling supply and demand, to increase the use of gas in the domestic sector (and to meet the needs of consumers), and to make gas truly affordable in Indonesia, including ending the disparity of pricing among gas consumers in different areas.

A wide operational remit has been suggested for the intended gas aggregator. This remit would include the functions of buying gas produced by production sharing contract (PSC) contractors,

¹ Mailinda Eka Yuniza et al., *Natural gas aggregation and the opportunity for synchronization under Indonesian Law*, *Journal of World Energy Law and Business*, 9, 388-409 (2016).

importing gas to meet national demand, aggregating gas supplies, determining the sales price for consumers, consummating gas sales arrangements (which could also include taking over control of existing contracts for the sale and purchase of gas previously been entered into between PSC contractors and state-owned gas and electricity companies) and constructing gas transmission and distribution infrastructure.

The draft Presidential Regulation envisaged: (1) the creation of a number of separate aggregators (each of whom would be state-owned enterprises), each with responsibility for the management of a defined aggregation area (which could be local, regional, or national); and (2) the possibility of separate supply-side aggregators (for the management of procuring gas) and demand-side aggregators (for the management of selling and supplying gas). Any existing aggregation activities already being effected would be assigned to a state-owned enterprise, to act as aggregator.

One of the possible candidates for the assumption of at least some part of the aggregation function, it has been suggested, could be Pertamina, the former state oil and gas company. The exact detail of how this multiplicity of aggregators is intended to function has yet to be worked out, and the Presidential Regulation has remained a draft, but the intention of interposing state-owned enterprises into this function is clear (although the draft also denies that an aggregator will have regulatory responsibilities).

The logic for having a high degree of state interference in the creation and operation of an aggregation function could be derived from the prevailing legal and regulatory regime within which such aggregation is intended to take place. In the Indonesian context, the Constitution of 1945 obliges the state to intervene to protect the welfare of the people, and particularly so in the context of managing indigenous energy resources, which, some argue, could extend to implementing a regulatory framework that best meets indigenous demands for gas.

Tanzania

In October 2013 the Tanzanian government issued the National Natural Gas Policy of Tanzania (NNGPT), which sought to provide guidance for the development of the Tanzanian domestic gas sector. The NNGPT states that priority will be given to the development of gas for the domestic market over export possibilities. At the heart of the NNGPT was the proposed establishment of an aggregator (defined in the NNGPT as “a fully state owned enterprise which will have exclusive rights to purchase, collect, transport and sell natural gas produced in the country”).

From this, a new Petroleum Act came into force at the end of 2015 and introduced a wide-ranging regulatory framework for all aspects of the oil and gas sector in Tanzania. Under the act, which updated and consolidated several earlier pieces of legislation, the Tanzania Petroleum Development Corporation (TPDC), a state-owned enterprise, was mandated as the official national oil company and was granted the exclusive rights to manage the country’s gas sector, including (whether by itself or through subsidiaries) the aggregation of gas and the ownership and operation of major gas infrastructure items. The act also provided for a DSO for gas to apply to all producers. Exactly how TPDC will perform this management function and what form the aggregation model will take and still remain to be seen, although the act was also careful to state that TPDC’s role as aggregator would not extend to the management of gas intended to be exported in the form of LNG.¹

Ghana

The Ghana gas market has seen the introduction of and the subsequent movement away from, a single buyer model for gas, with the creation of the Ghana National Gas Company (GNGC). GNGC was a state-owned entity that was intended to act as the exclusive marketing interface between

¹ See www.resourcegovernance.org/sites/default/files/documents/netotiating-tanzania-gas-future.pdf.

offshore gas producers and downstream gas buyers (principally power generators) in the sale of associated and non-associated gas. This regulatory intervention was made essentially to create a measure of involvement in the operation of the gas sector for a new state-owned enterprise and not because of any perceived failing in the sector.

Early experience suggested that the presence of GNGC increased transaction times and costs and added an unnecessary layer of contractual complexity. There was also a concern that GNGC was not, in and of itself, inherently creditworthy and that upstream gas producers were not exposed to any improvement in the risk of non-payment by downstream buyers that they otherwise would have assumed in direct gas sales. Consequently, more recent developments have seen the absorption of GNGC into the Ghana National Petroleum Corporation (GNPC) and the movement toward disaggregated gas sales for certain projects.

More recently, the Ghanaian government economic forecasting has focused on aggregated delivered gas prices across a variety of indigenous and imported gas sources.¹

4. Aggregation as a Transitional Step

The introduction of aggregation, in whatever form it takes, into a gas sector does not have to be a permanent feature. Indeed, a regulatory intervention such as the creation of an aggregator is usually intended to be a temporary measure (although how long “temporary” means is always debatable) on the road of transition to a competitive gas sector. Once the policy goal of security of supply of gas has been realized, then the regulatory intervention could be abrogated when the effective supply of gas has become a naturally operative function within the sector. That said, it could of course become apparent that aggregation functions well in its own right and should continue to apply.

If transition is the intention, because of a concern that the continuing presence of aggregated trades could lead to market distortions and could prevent true competition from flourishing, then care needs to be taken to recognize the point at which a gas sector has generated sufficient depth that it could be regarded as self-sustaining through bilateral trades without aggregation. But recognizing exactly when this transition point has been reached can be a difficult.

The development of the United Kingdom gas sector is a good example of how aggregation was used to perform a critical role in establishing the sector before being discontinued. The United Kingdom gas sector today illustrates the willing seller/willing buyer model in operation, yet it was not always so. The sector evolved from a much more managed model, which openly applied gas aggregation to establish the first iteration of the sector.

BGC had a short but spectacular life. Created in 1972, BGC was privatized as British Gas Plc in 1986, as part of the drive toward liberalization of the United Kingdom gas sector and in a series of later demergers in 1997 and 2000, British Gas Plc was broken up into several separate businesses (one of which was a separated owner and operator of the NTS). As part of the process of liberalization, the sale of United Kingdom gas production from offshore producers to onshore consumers became an open and contestable activity for the first time.

It is perhaps easy, when viewed from the comfort of an age of regulatory enlightenment, to view the existence of a monolithic creature like the BGC as grotesque, but such hindsight ignores the reality that the gas aggregation model the BGC represented was an essential and unavoidable first step on the road to establishing the success that is the United Kingdom gas sector is today. Without gas aggregation the United Kingdom would have struggled to launch straight into a successful willing seller/willing buyer model as significant volumes of offshore gas production came into the market. The negotiation of contract terms, gas pricing, and risk allocation might have taken place in a localized and partisan

¹ www.energycom.gov.gh/planning/data-center/energy-outlook-for-ghana?

manner and perhaps only the economically most favorable deals would have survived. Producers might even have turned their backs on offshore gas project development prospects without a meaningful buy-side opportunity to tap into. The gas transportation infrastructure needed to develop a deep and liquid market for multiparty gas sale and purchase contracting was also not there. The NTS might not have been built, at least in the form that it exists today and the matching up of supply and demand through available pipeline capacity would only have happened through small-scale, bilateral pipeline development deals. The NTS, if it would have developed at all as such, might only have developed piecemeal, with inconsistent standards and poor national coverage.

Conclusion

Aggregation has a number of different meanings. There is no single model for aggregation that is capable of universal application to all gas sectors and while there may be many perceived operational deficiencies within a particular gas sector, aggregation (in whatever form is chosen) will not necessarily remove all of those deficiencies in a stroke. Aggregation has to be tailored specifically to reflect the regulatory needs of the sector in which it is intended to operate, and before any process of aggregation is embarked upon, there must first be a careful consideration of the regulatory and economic objectives that such aggregation intends to secure, to ensure that the model will deliver against those objectives and will not be doomed to failure at the outset.

Aggregation, in one form or another, has enjoyed a colorful history in the regulatory shaping of several gas sectors. It has been applied successfully to the definition of nascent gas sectors in Trinidad and Tobago and the United Kingdom. It has been applied, with varying degrees of success to the gas sectors in Singapore, Ghana and Tanzania and it has been threatened to be applied in Israel and Indonesia. It has almost certainly failed in Nigeria. In none of these instances have the existing conditions for the application of the model, nor have the eventual outcomes (where it has been applied) been the same.

Aggregation is a flexible model, capable of being deployed differentially and of achieving different results, which means that it must be applied purposefully and with great care if it is to be effective. If executed properly, aggregation can help in the promotion of an effective gas sector that offers security of supply and protections that all of the sector participants need. But proper execution requires that a careful construction of the right form of aggregation be applied to the sector, as there is no single expression of aggregation. The easy mistake to make, when it comes to introducing any program of regulatory engineering to better develop a gas sector, is to go straight to asking how the sector should be regulated. The essential question to ask first is why the sector needs to be regulated differently to how it already is. Only then, when the mischief that the regulatory model is intended to remedy has been clearly identified, will there be a better chance of selecting and applying the right regulatory model and making that model work. And that model might, or might not, be aggregation.

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