Research Paper on

The Role of the Central Purchasing Agency

CAPACITIES FOR AN ENERGY TRANSITION

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Eskom

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SAGEN SOUTH AFRICAN-GERMAN ENERGY PROGRAMME

NORD POOL

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Contents

Abbreviations

CCGT	Combined cycle gas turbine
CRM	Capacity Remuneration Mechanism
CPA	Central Purchasing Agency
DMRE	Department of Mineral Resources and Energy
ERA	Electricity Regulation Act
ESI	Electricity supply industry
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IPP	Independent power producer
NERSA	National Energy Regulator of South Africa
PPAs	Power Purchase Agreements
REIPPP	Renewable Independent Power Producer Programme
SMP	System marginal price

1. Introduction

1.1 Background

The South African–German Energy Programme (SAGEN), funded by the German government and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), was approached by Eskom Transmission to provide further technical assistance and capacity building for the implementation of reforms in the power sector. This research paper has been developed under the project "Capacities for an Energy Transition" as an input to the power sector reform process. It serves as a high-level description of the Central Purchasing Agency (CPA) and how it is intended to function. Separate documents created under this support project outline the overall expected high-level market design for South-Africa and how a Contract for Difference works. It is beneficial for readers of this document to also read these papers as they are interlinked and provide insight into key aspects of how the future electricity market in South Africa could work. This report was prepared by Hans-Arild Bredesen from Bredesen Consulting acting as a sub-contractor to Nord Pool Consulting.

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1.2 Content

This research paper presents the underlying concepts of the market model, more specifically as:

a) The South African electricity supply industry

b) The key functions of the Central Purchasing Agency (CPA)

c) Appendix 1 on capacity remuneration mechanisms (CRM)

Disclaimer: The development of the South African market is a work in progress, where the described market model and the Central Purchasing Agency, including its detailed rules, are being developed in parallel with this paper (and will continue to evolve over time). The final market will also be influenced by the final changes to the Energy Regulation Amendment Bill (ERA) and potentially other governmental decisions.

2. The South African electricity supply industry

As detailed in the Eskom Transmission research paper, “The South African Electricity Market”, the South African government is in the process of establishing a competitive electricity market. The transition to a competitive market model will be based on a stepwise implementation of various market segments, as well as a phased introduction of participants to the South African power market. Figure 1 shows a schematic of an electricity supply industry with a competitive market.

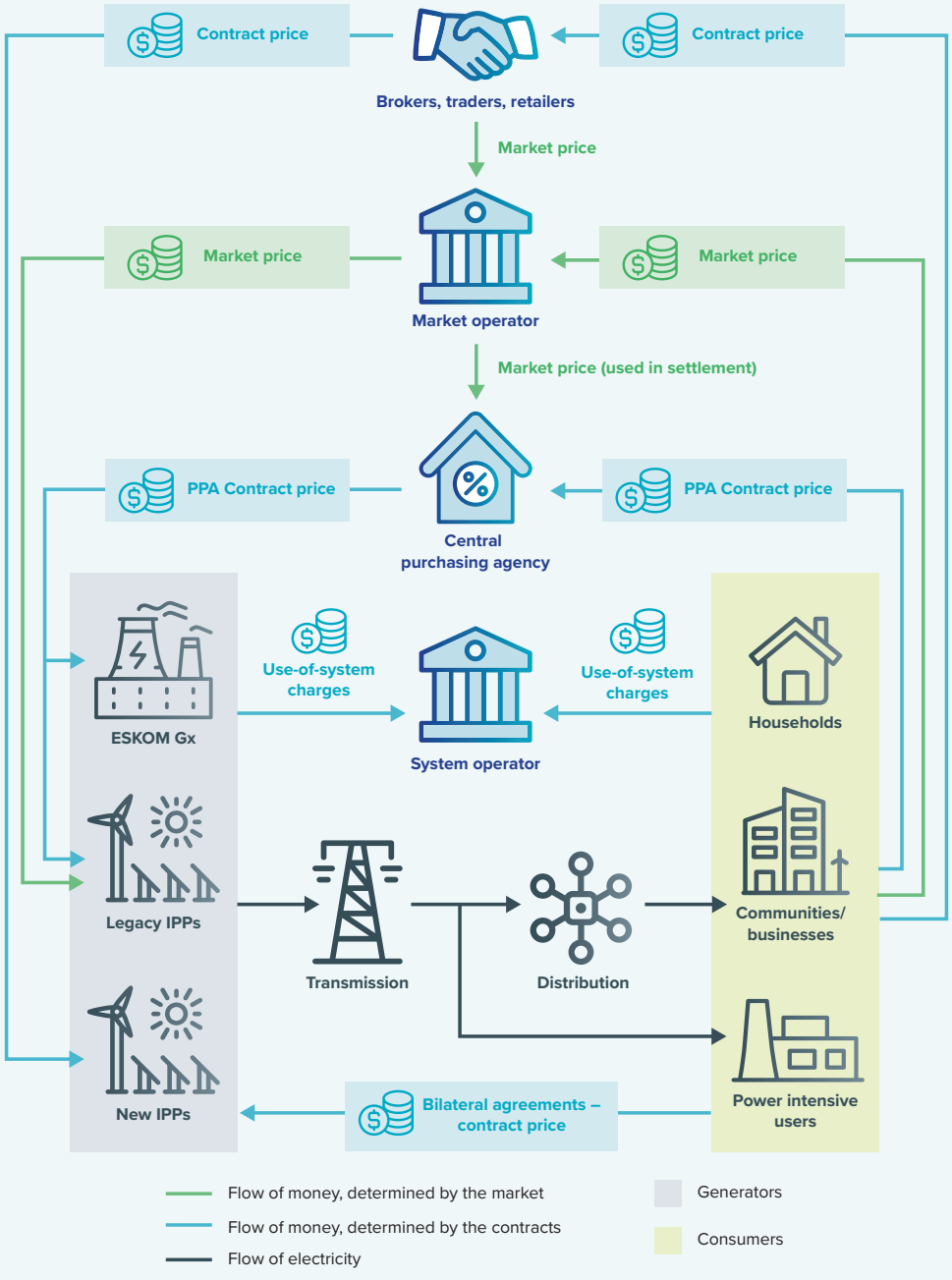

Figure 1. Participants in the South African electricity supply industry

In a fully-fledged market, a **generator** can sell electricity to eligible **consumers** while the **transmission** and **distribution** networks operate independently of the market to provide non-discriminatory access to all stakeholders.

To facilitate this process, Eskom is currently functionally unbundling into separate generation, transmission and distribution entities. A **use-of-system** tariff will be paid to the System Operator, to cover all costs associated with owning, operating and expanding the network. The System Operator is responsible for the processes required to deliver electricity to consumers (dispatch instructions, metering, balancing), while the **Market Operator** is responsible for managing the market platforms and all transactions that occur on it. As the delivery of electricity is intrinsically linked to the market within this system, the Market Operator and System Operator work in close collaboration, at all times. In contrast to a centrally planned environment, a competitive environment allows eligible generators to enter the market and create new capacity based on price signals indicating when it would be most profitable to invest.

Where these market mechanisms are deemed to be insufficient to ensure security of supply and/or market liquidity, contracts for additional capacity can be entered into with a special purpose vehicle as part of the CPA, which performs a supporting role within the market.

3. Central Purchasing Agency

The market structure outlined in the Article 32 of the Draft Electricity Regulation Act Amendment Bill (March 2022) defines the CPA as an entity that will be created within the Transmission System Operator to fulfil the role of counterpart to contracts necessary to facilitate the transition to a competitive market, as well as managing non-market agreements or services aligned with the competitive market. Its activities will include

a) Concluding **Power Purchase Agreements** (PPAs) with Eskom Generation power stations **(vesting contracts)**

b) Becoming the counterpart to existing PPAs with independent power producers **(legacy contracts)**

c) Trading all energy purchased under PPAs into the Day Ahead Market (DAM)

d) Concluding sales agreements with distributors

e) Procuring the ancillary services required by the System Operator.

PPAs are bilateral agreements that specify the price at which the electricity produced would be bought at for a set number of years. The existing internal Eskom Dynamic Energy Market and PPAs form part of a regulatory “sandbox” environment. This means that the market is already being used as designed, with prices determined according to the market.

Similarly, the PPAs with Eskom Generation and Eskom Distribution are applied as per the agreed calculations and principles in these contracts. However, once these payments are determined according to the market, they are hedged back to a regulated revenue determination made by the National Energy Regulator of South Africa (NERSA). The "sandbox" operation means that the parties are not subject to the financial effect of the payments and charges but are able to learn how these processes will work in the future market.

Given that the CPA effectively serves as an intermediary between the market and several key participants, the extent of the shortfall experienced by the CPA on a monthly or annual basis is determined predominantly by the market price in the DAM for energy. A higher market price would reduce the shortfall with the agreed upon price and a lower price would increase it.

One proposal within the tariff unbundling process at the wholesale level is to create a **legacy charge** that would be payable by all consumers connected to the Eskom Transmission network, and by extension passed on by Distribution to customers connected to the Distribution network. The legacy charge could be applied either as a variable charge (c/kWh) dependent on energy consumed on the network, or as a fixed charge (R/kVA) dependent on either a notified maximum demand or actual maximum demand. A key component of calculating an expected legacy charge (which would be approved by the regulator as part of the Transmission network charges) would be to estimate the market price up front and adjust the legacy charge as part of an annual process. In the event that the market price deviates from the projected market price the CPA would experience cash-flow risk.

The costs of the CPA could therefore be recovered by:

- Calculation of a wholesale tariff, against which downstream market participants will be hedged
- Separation out of the legacy charge contribution from all consumers.

3.1 Eskom Generation Vesting Contracts

At present approximately 95% of the electricity produced in South Africa is produced by Eskom Generation, primarily through coal-fired thermal power stations. If a competitive market were declared fully operational today, Eskom Generation would have such dominant market power that they would effectively have the ability to determine the price of electricity. Concluding PPAs between the CPA and Eskom-owned power plants serves three purposes; firstly, to curb the power Eskom Generation would otherwise have in the market, secondly to ensure the financial viability of these existing plants for the remainder of the plant life and thirdly to provide revenue for key services to support the South African grid.

The contracts are based on a standard agreement signed with each power plant, with specific regulations based on the technologies and cost structure of the respective generation facilities. The agreements shall be structured based on the assumption that the parties will not be part of the same company structure and will thereby fulfil all the legal requirements for a bilateral agreement between two independent entities.

The contracts typically consist of two parts; the first applied over the lifetime of the plant and the second expiring over time. The first part specifies an agreed upon capacity payment to cover the fixed capital, operational and maintenance costs required by the plant and a payment for special ancillary services such as black starting and islanding. The second part specifies a fixed energy and reserve capacity price (**hedge price**) to be applied at the start of the contract and the process by which this fixed price might gradually transition to the market price over time. The power stations are obliged to offer all their output to the South African market (existing and future) and this power is first bought or sold in the competitive market then hedged back to the agreed upon fixed price. Eskom Generation will be the balance responsible party for all its generation.

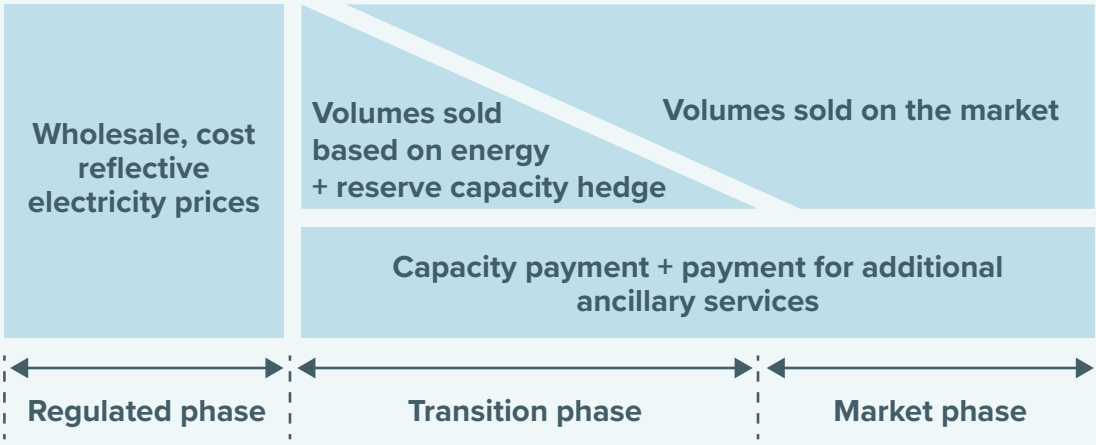

Figure 2. Schematic overview of the Eskom GX Power Purchase Agreements

A schematic overview of the PPAs with Eskom Generation power stations is illustrated in Figure 2. These PPAs will cover the following standard components:

- A **capacity payment** covering the fixed capital, operational and maintenance cost of the individual power station.
- An **energy hedge** that will (for a proposed stepwise period of five years) level the market price to an agreed upon energy price for a specified output. The stepwise period will progressively expose Eskom Generation to the market prices.
- A **reserve capacity hedge** that is similar to the energy hedge; agreeing on fixed prices from the start but moving towards market prices in the end. This hedge is a payment for capacity to be made available at short notice.

Required additional ancillary services that cover special technical services for the System Operator such as black starting, islanding and other agreed pass-through costs.

In the following sections, further details on these components are defined.

3.1.1 Availability or capacity payment

The key component of the availability or capacity payment will be an **Availability Rate**. The inputs to this are based on a set of key parameters:

- *Nominal Annual Capital recovery* (in Rand/annum)
- *Nominal Annual Fixed Maintenance recovery* (in Rand/annum)
- *Nominal Annual Fixed Operating Cost recovery* (in Rand/annum)
- *Nominal Annual Fixed Fuel Cost recovery* (in Rand/annum)
- *Expected Energy Availability Factor (EAF)*, based on an agreed annual availability factor for the power station's combined set of generating units measured monthly.

These figures are based on an individual assessment per power plant and are agreed upon by the CPA and the power plant. The parameters will be used to calculate a monthly Availability Rate expressed as a R/MW/h applicable to the power plant.

In addition to these direct input parameters, there are two more risk management elements that are used to calculate the Availability Rate:

- **An Availability Cone**, a specified allowable variation of the EAF due to over and under generation, to reduce risk for both parties and ensure a more stable financial output
- **An Availability Penalty**, applied when power plants do not adhere to their declared availability in the market.

For more details on generic CRMs see Appendix 1.

3.1.2 Energy hedge

The energy hedge is based on an agreed upon **annual average marginal** cost for the energy output of the units of the power plant, called an **Energy Rate**. The power plants are allowed to bid an incremental cost curve in the DAM, where the volume-weighted average price of the cost curve cannot deviate more than 30% up or down from the Energy Rate.

The power plant will be paid (or will pay) the difference between the Energy Rate and the average system marginal price (SMP) from the DAM. As with the availability payment, there is an upper and lower band of the payments covered by the energy hedge. This shall be specified as a monthly value in the agreement.

This is a way to agree on a fixed price (for example, based on a contract such as the PPA between the CPA and Eskom Generation), where the power is bought or sold in a competitive market and then hedged back to the agreed price. A generic mechanism that

is employed in a lot of markets to facilitate such a hedge, also in energy markets, is called a Contract for Difference (CfD). For more details, see the Eskom Transmission research paper entitled “Contracts for Difference”.

3.1.3 Reserve capacity and other ancillary services

The **reserve capacity hedge** (Instantaneous, Regulating, and Ten-Minute Reserves), is applied in a similar way to the energy hedge. The requirements, selection and pricing of these reserves is done in the competitive market, but the PPA administers a hedge back to an agreed price for this service that is related to the Energy Rate.

In addition, a PPA typically covers various ancillary services with different technical requirements and different kinds of remuneration. Most of the ancillary services require various forms of prequalification such as required testing and certifications that are defined in detail. These ancillary services may include

- **Black start:** starting a unit without external grid support
- **Unit islanding*:*** continuing to power an area without external grid support
- **Reactive power and voltage control:** power plants suppling or absorbing reactive power as necessary to maintain voltage and stability on the transmission grid.

Last, but not least, the PPA covers the respective power plant costs incurred in starting up a generating unit when it has been placed in cold reserve mode by the System Operator, or due to market conditions until called up by the System Operator or in the market.

From time to time, some power stations could become a consumer. This could, for instance, happen when the plant is out for maintenance, but still has commitments to generate power. If so, their consumption is included as negative generation in the calculation of the energy sales covered under the energy hedge in section 3.1.2. The power station could also, in certain circumstances, consume energy for the purposes of auxiliary supply and other supply requirements. This energy may be purchased from a distributor through the customer billing system, or from the CPA. If this is under the PPA, the consumption points must be identified in the contract and the power station will pay the CPA for the power consumed per month at the same Energy Rate as agreed in this agreement.

3.2 Independent power producer legacy contracts

Additional capacity of 6.5 GW has been procured from 34 **independent power producers** (IPPs) through multiple rounds of the **Renewable Independent Power Producer Programme** (REIPPP). The capacity requirements for this procurement programme were based on a ministerial determination by the Department of Mineral Resources and Energy, in line with the Integrated Resource Plans of 2010 and 2019. The counterparty to the contracts entered into by the IPPs was Eskom. However, in a market environment, Eskom would no longer be the single buyer of electricity and would in fact be a competitor. Moreover, the price specified in these contracts is likely to be non-competitive on an open market, as it ensured a guaranteed rate of return for IPPs that created new capacity in a risky investment environment. Nonetheless, the obligation to honour the terms negotiated within those contracts remains.

The CPA will therefore incorporate the role of the IPP office, to manage and be financially responsible for the existing PPAs with IPPs (legacy contracts). The CPA will participate in the DAM on behalf of these generators for all the electricity produced under these agreements. The CPA will then become a market participant, but because of its central position during the transition it should not be able to be an active trading participant. Instead, the forecasts from the REIPPP and the dispatch costs will be submitted to the DAM and the CPA will effectively become a price-taker in the market. The IPPs will remain balance responsible for the forecasted output that will be sold via the CPA. This will ensure a managed migration to a fair and effective competitive market.

3.3 Concluding sales agreements with qualifying customers

3.3.1 Qualifying customers

Initially Eskom Distribution would be the only customer eligible to conclude a sales agreement in the form of a hedging contract. However, as this agreement is a complete bilateral agreement it can be used for any qualifying customer in the future. This contract has the same general structure as the Power Purchase Agreements for Eskom Generation.

3.3.2 Energy charge and hedging arrangements

A qualifying customer (initially Eskom Distribution) will pay for the power they consume at the SMP established in the market, based on their own demand forecast. As with the Eskom Generation PPAs, there is a hedge in place, where the buyer will have to pay the difference between the active energy charge of the wholesale energy prices (agreed upon price) and the weighted average SMP in that time-of-use period (market price). The wholesale energy price is currently the agreed tariff approved by NERSA. The qualifying customer will also be subject to imbalance charges (or payments) per the market rules. Lastly, this PPA also covers management of load shedding activities by Eskom Transmission, under system emergency conditions declared by the National System Operator.

3.3.3 Capacity charge

In addition to the energy charge outlined in the previous section, a capacity charge is applied. A qualified customer is charged a capacity charge based on their maximum consumption in any hour of the previous 12 months (essentially a maximum demand charge). The charge is the maximum demand rate (currently set as the amortised hourly fixed cost of a combined cycle gas turbine plant) number of hours in the month. There is also a capacity rebate applicable where load shedding events have been issued.

3.4 Future capacity assessment and procurement

The CPA is also tasked to develop indicative generation expansion plans, which are published to inform market participants. The CPA will monitor the market for capacity delivery against these plans and embark on procurement if projected capacity requirements are not being realised by the market. It is expected that over time, supply and demand will become more closely aligned and that there will be no need for the CPA to manage this, but this function will likely be needed in the short to medium term. It provides a fall-back position, to ensure the System Operator has resources to meet real-time demand at any point in the medium- to long-term view.

Once the generation expansion plan is agreed upon, there are two generic options to procure this capacity:

- A form of Capacity Remuneration Mechanism (CRM)
- An energy hedge contract (Contract for Difference)

The main difference between these two support mechanisms is that in a CRM (see Appendix 1), you pay for the capacity to be available, while in an energy hedge (or Contract for Difference) you are guaranteeing a price for the power that is being sold in the markets.

In addition to the procurement of future energy capacity, the CPA is tasked to perform the required long-term ancillary services on behalf of the System Operator, either incorporated into capacity contracts or as stand-alone ancillary service agreements.

3.5 Potential future additions

It is expected that the functions of the CPA could be extended to other tasks over time. A potential addition to the function of the CPA is that it could serve as the procurer of power for vulnerable customers (that is, non-paying). This would have to be funded through governmental support, but then the CPA could act as a buyer of this power in the market, ensuring that the generators and distribution network operators (DSOs) or transmission system operators (TSOs) that provide the service get paid.

4. Conclusion

In conclusion, the CPA is envisaged as a vital market support entity that facilitates transition to a competitive market and supports the nonmarket functions required to create a stable electricity supply industry. By entering into various contractual arrangements with market participants, the CPA can serve as an intermediary to encourage market participation and mitigate the risk and market power of dominant market participants.

5. Further reading

DMRE (Department of Mineral Resources and Energy) (2022) Draft Electricity Regulation Amendment Bill. *Government Gazette* 45898, 10 February. Available at: https://www.gov.za/sites/default/files/gcis_document/202203/45898gon1746

DPE (Department of Public Enterprises) (2019) *Roadmap for Eskom in a Reformed Electricity Supply Industry*. Available at: https://dpe.gov.za/wp-content/uploads/2019/10/ROADMAP-FOR-ESKOM_0015_29102019_FINAL1.pdf

Appendix I: Capacity remuneration mechanisms

Generally, capacity payments is a term that encompasses a lot of different potential measures. Therefore, these are more generically referred to as **capacity remuneration mechanisms** (CRM). The market-wide capacity mechanism for South Africa has not yet been decided. Typically, capacity mechanisms are based on a requirement to solve a specific issue. For instance, the capacity payments (or availability payments) that are part of the Eskom Generation PPAs are simple capacity payment solutions, where they intend to cover for the PPA holders' fixed capital, operational and maintenance costs. Based on a declared availability, Eskom Generation will get paid for these costs through the PPAs.

This type of trading activity is used to ensure electricity supply on a longer-term basis. The determination of the requirements to ensure supply stability is performed by the System Operator, who calculates the requirements for both the total capacity and strategic reserve. Market participants can then agree to make existing capacity available for a fee (capacity payments and **strategic reserve schemes**) or enter into contracts to build new energy infrastructure for an agreed upon price (**capacity auction schemes**), with the cost of remuneration for the capacity market borne by the consumer.

Capacity payments can be made to both consumers who reduce their demand and generators who increase their supply of electricity. A wide spectrum of options exists for these payments, categorised according to several factors, including the kind of capacity being made available, how far in the future the obligations span and how the payment costs are determined and allocated. In a strategic reserve scheme, some generation capacity is set aside to ensure security of supply in exceptional circumstances, which can be signalled by prices in the Day Ahead, intraday or balancing markets increasing above a certain threshold level. The capacity to be set-aside is procured and the payments to the generators determined through a (typically year-ahead) tender. The security of supply can also be addressed through **capacity obligation schemes**, which places an obligation on big generators or consumers to make capacity available at certain times or face penalties. Lastly, availability of existing capacity can be addressed through a **reliability option**, a mechanism in which contracted generators agree to cap the price at which they sell electricity. This effective cap is implemented by generators paying the System Operator the difference if the market electricity price exceeds a reference price. Importantly, the difference between the agreed upon price and reference price has to be paid by the generator, whether they are producing electricity at that time or not. This creates an incentive for the generator to produce electricity at times of scarcity when the price of electricity is high, because if they didn't, they would have to pay the difference without any revenue from the sale of electricity. In return, the generator benefits from a guaranteed stable income stream.

In **capacity auction schemes,** participants bid for contracts to build new energy infrastructure at a price determined through an auction process. Potential investors benefit from both a guaranteed return on investment and an upfront payment, while the market benefits from ensured capacity and stabilised prices. Without this type of CRM, price signals would dictate when generators invest in new energy infrastructure; when there is limited electricity supply, prices go up and it becomes more profitable to sell electricity. In this scenario, generators take on more risk, because if the price of electricity goes down while they are still building new capacity, they stand to make a loss. However, the potential reward is also higher, because if the price of electricity becomes very high, they stand to make more profit. In either scenario the cost is borne by consumers; CRMs spread these costs out over time to reduce price volatility but may result in a higher overall payment.