

# E-Learning Energy and Utilities



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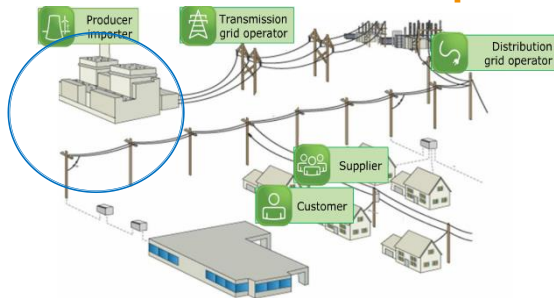
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# Market parties

## 1.1 Introduction

In this module we will be looking into the different market parties. What are their roles and responsibilities, which topics are interesting for further exploration, and which hot topics do these market parties face.

## 1.2 Producers and importers



The first market party we will discuss are the producers and the importers. These would be the companies that either generate or import the energy. Some commodities can be generated or produced such as electricity or water. For other commodities we need to rely on natural resources.

If a country does not have a natural gas supply for example they would need to import. Either way the producer or importer can be considered the starting point of the utility value chain as they put the energy or utility on the network.

Some interesting topics to explore would be how electricity is being generated.

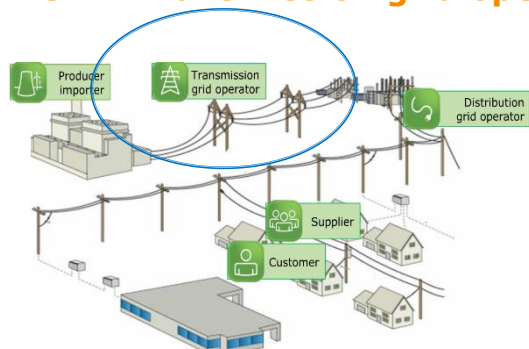
This can be done by operating nuclear power plants, or by using turbines relying on fossil fuels. Fossil fuels however cause air, water and soil pollution, and contribute to global warming. Hence we are seeing an increased amount of renewable energy sources. Examples are solar energy, wind energy, hydropower, geothermal and tidal energy. In several countries solar panels seem to pop up like daisies, both large scale investments in solar power plants and Average Joe's relatively small scale solar panel for self-consumption. Benefit is that also remote rural areas, which are not connected to the energy grid can now easily generate their own electricity through local production.



	<b>Topics to explore</b> <ul style="list-style-type: none"><li>• Electricity generation</li><li>• Fossil fuel generation</li><li>• Solar production power plants</li></ul>
	<b>Hot topics - Challenges</b> <ul style="list-style-type: none"><li>• Renewable energies</li><li>• Local production</li></ul>

The production of energy through renewable energies does pose quite the challenge. As the amount of energy being produced is inconsistent, this will need to be balanced by input from conventional power stations, which is called spinning reserves. If there is a large influx of energy from the renewable source, this would imply that the power station would need to reduce production. Nonetheless they do need to remain available, implying that they need to be constantly up and running, making them inefficient and expensive. Ramping the plants up and down would produce so much CO<sub>2</sub> that we could end up increasing our overall emissions rather than reducing them.

### 1.3 Transmission grid operator



Once the electricity, gas or water has been placed on the network it will need to be transported. The transport or transmission over long distances is done using a high pressure or high voltage network which is called the transmission grid. The transmission grid operator or in short TGO is responsible both for maintaining the grid and for the actual transmission of the commodity.

Generally one might say that a TGO links one or more energy generators or importers to one or more distribution companies. Also large industrial customers may be connected directly to the transmission grid.

In the gas market, the TGO will also be responsible for storing gas... Unlike electricity however gas can be stored in e.g., a depleted reservoir or by increasing the pressure of the gas within the network. This will facilitate a response on peak demand.

Finally, the TGO needs to ensure safety by checking that any work undertaken near electrical or mechanical equipment can be carried out safely or by placing high intensity flashing lights on overhead transmission lines to identify the wires to any air traffic.

Some interesting topics to further explore with regard to the TGO would be inter-grid connectivity. Natural hazards and an imbalance between energy generation and consumption are a major cause of concern. To minimize the probability of grid instability and failure, regional or national transmission system operators are interconnected to each other. Between them, they share responsibility for the overall load management on the main distribution grid.



	<b>Topics to explore</b> <ul style="list-style-type: none"><li>• Inter-grid connectivity</li><li>• Energy storage</li></ul>
	<b>Hot topics - Challenges</b> <ul style="list-style-type: none"><li>• Increasing demand on aging grid</li></ul>

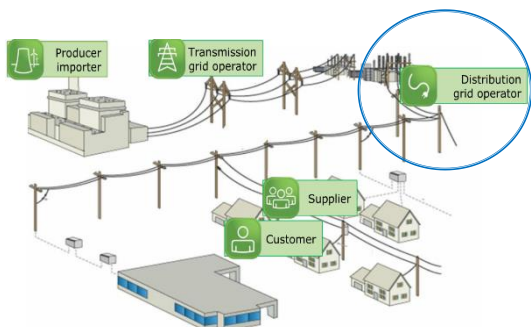
Challenges TGOs are currently facing are an increasing demand for power on an aging grid which quite often already is stretched to capacity.

In several countries the grid was initially set up about 50 years ago, and this still constitutes the majority of the current network. In those days most people didn't require computers to do their job, did not have Internet access, smart phones and so on.

You can imagine that our demand for electricity has increased considerably. Questions that arise are whether the grid will need to expand to accommodate the increased demand, or if local production can account for this. In this case a grid facelift might still be required.



## 1.4 Distribution grid operator



Distribution is the final stage of the utility value chain. The distribution network takes electricity, gas or water from the transmission system and lowers the voltage or reduces the pressure. The electricity, gas or water will then be transferred onto your local distribution network and is delivered to your home where, in many cases, it will be passed through a meter into your home's network.

The distribution Grid Operator or DGO is the market party responsible of the distribution of energy between the high voltage or high pressure grids and the end customer's connections. This would be their main task, though depending on the local regulation, the DGO can also be responsible of additional tasks such as installing, maintaining, removing or replacing the meter. Due to the nature of their tasks, the DGO market role is a regulated role. It would not make sense to set up multiple distribution networks. Hence customers can't select their DGO, they would have a designated DGO depending on the physical location of the connection. Distribution charges would be billed directly to the customers or to the suppliers, in which case the suppliers would pass through these costs to their end customers.

Many people do not realize all the steps involved when it comes to supplying water, gas or electricity. They just turn on the light, the heating or start running a bath without giving this a second thought. It might be interesting to look into how utilities are being distributed in your region.

A challenge or hot topic is the question the DGO can charge customers a fee for their local production. Think of customers with an overproduction of solar power energy. This energy will be put on the distribution network and can then be used by other customers. Would they need to pay a fee for this, and if so, would this fee be proportionate to the amount of energy they put on the network?



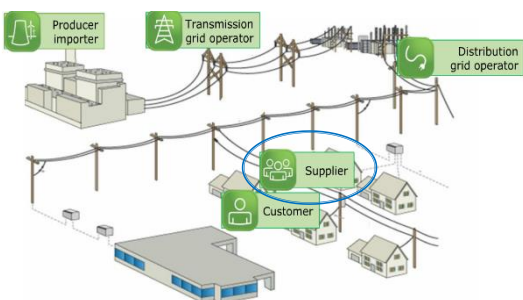
### Topics to explore

- Electricity distribution
- Natural gas distribution

### Hot topics – Challenges

- Local energy generation

## 1.5 Energy supplier



In the deregulated market, the supplier is the market party who actually closes the contract with the end-customer. He will need to buy the correct amount of energy in order to be able to supply this to his customer base. As such, he must forecast the consumption at every moment of the day throughout the year. There is a variety of methods for forecasting, most of which consider amongst other things the real load profiles of the industrial

customers in combination with a synthetic or artificially generated profile for domestic customers.

The supplier will then negotiate with the different producers, to procure the energy at the lowest cost possible.

Nowadays suppliers often offer products containing a certain percentage of renewable energy. Consequently, the supplier will need to bear this in mind when buying energy, to ensure that he purchases the correct amount of sustainable energy.

Next to the procurement of energy, the supplier is also responsible for the billing and collection process with his customers. He gets the meter reading or the consumption values, and calculates the respective invoices. After sending these invoices to the customers, he will follow up the payment cycle by matching incoming payments, and if required, start the dunning process for those customers whose invoices are past due.

Interesting to explore would be the website of your provider. Which contract terms and conditions do they apply? Can you cancel out on your agreement and which charges would you get for doing so? Suppliers often also have a section of their website explaining how to understand the invoice they sent. What exactly are you being charged for, what is a part of the invoice?



**Topics to explore**

- Terms and conditions
- Understand your invoice

**Hot topics - Challenges**

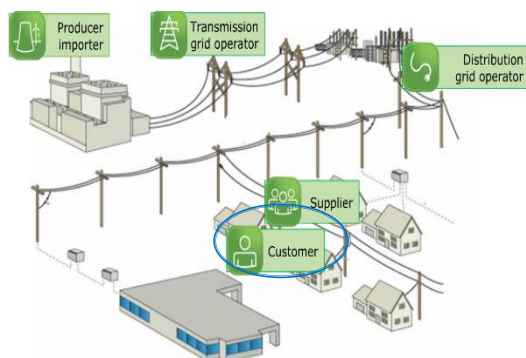
- Conscious customers
- Competition

A hot topic for the suppliers is dealing with competition and the increasingly conscious customer. Impeccable error-free service is considered a hygiene factor, and 24/7 service is more and more requested. Important to the conscious customer is: clear invoices, cheap prices, fast service, multiple channels,...

Competition on the other hand pushes utilities into launching new services to increase their market share. Energy audits, maintenance and even energy related insurance products are being sold together with the basic commodity.

Some suppliers even start selling Home Energy Management devices, again coupled with services. In addition to the fact that these products are more tangible, and thus easier to sell, they can mean a lock-in for the supplier, since once the device is installed, it is much more difficult to switch supplier.

## 1.6 Customer



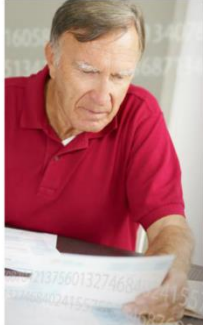
The customer is the one who actually uses the energy and will obviously also need to pay for his consumption. He may be invited to send meter readings to the suppliers. Furthermore, he triggers suppliers switches, move-outs, meter switches and so on.

Customers may also report a defective meter or a wrong invoice in case the consumption or invoice amount is not realistic. It makes sense that customers want to report an invoice if the invoice amount is too high, yet customers also report an invoice if the amount is too low. This to avoid a rectification with a huge invoice amount the next billing period.

It may be interesting to look into the different suppliers in your region and compare their offers, though comparing the suppliers and their tariffs might be quite the challenge if you want to make sure that you are comparing apples to apples.

Some current topics when it comes to the customer are an increased energy consciousness. Now that customers are comparing different suppliers they are increasingly aware of the energy they are consuming and the costs involved.

As suppliers often apply different prices depending on the time of the day, people have and are still changing their consumption patterns. Finally, we can also mention that many industrial and residential customers are currently self-providing by installing e.g. solar panels.




**Topics to explore**

- Compare energy prices

**Hot topics - Challenges**

- Energy consciousness
- Change consumption pattern
- Self provision

## 1.7 Balance responsible



**Topics to explore**

- Nomination
- Allocation
- Imbalance

**Hot topics – Challenges**

- Reliably predict output of renewable energy sources

Besides the market parties that we have identified so far, there are several other market roles to consider which are not explicitly linked to a single specific phase in the distribution process.

Let's continue with the balance responsible.

To ensure the security and quality of supply the network needs to be in balance, implying that supply and demand need to correspond. Let's consider electricity. If there is no balance between the production and the consumption of electricity this will result in power outages, because electricity cannot be stored on a large scale.

For gas, on the other hand, storage in large quantities is possible and commonly applied yet nonetheless the network needs to be kept in balance. To allow the movement of gas there needs to be a minimum pressure in the gas lines, to guarantee safety there is also a maximum pressure. This implies the pressure of the gas network needs to be within certain limits and to achieve this, a balance between demand and supply is required, like discussed before. This is where the Balance Responsible comes in. He makes sure that supply and demand are in balance by ensuring that the required energy is fed onto the grid.

The Balance Responsible will receive forecasts from all suppliers and will combine these in what is called a nomination. This is in fact a daily predicted consumption.

In a second step the balance responsible will receive input from the DGO on what has actually been consumed. This is called the allocation process. The difference between the nomination, or the predicted consumption, and the allocation or the actual consumption amount is the imbalance. This imbalance is being calculated on a daily basis. The Balance Responsible will charge this imbalance to the respective suppliers. The purpose of the imbalance is to stimulate efficient use of energy and grids.

## 1.8 Nomination – allocation – reconciliation

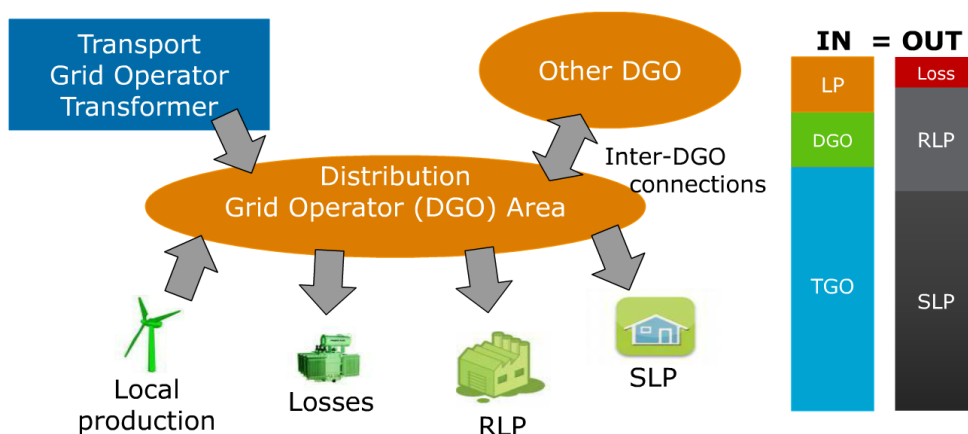
The nomination process is being performed by the Balance Responsible. He will receive daily forecasts from all suppliers and will combine these in what is called a nomination. This is in fact a daily predicted consumption. The nomination can be used to plan production and purchase, to determine the amount of energy that needs to be put on the grid.

In a second step the balance responsible will receive input from the DGO on what has actually been consumed. This input is based on Automatic Meter Reading data, so actual meter values and secondly on estimated consumption amounts for those connections requiring a manual read out. For these customers one would in fact work with profiling. This second step is called the allocation process.

The difference between the nomination, or the predicted consumption, and the allocation or the actual consumption amount is the imbalance. This imbalance is being calculated on a daily basis. The Balance Responsible will charge this imbalance to the respective suppliers. The purpose of the imbalance is to stimulate efficient use of energy and grids.

As a final step we would need to consider reconciliation which would in fact settle the errors caused by the fact that we used profiled consumptions. At this stage actual meter readings have been received and now actual volumes can be taken into account and the Balance Responsible can carry out settlement to the supplier.

Let's take a look at this graphically.



The allocation and reconciliation process takes into account all injections into the distribution grid, local production, TGO and connections with other DGOs. As such the infeed in the grid can be calculated. Secondly, it will aggregate all energy flowing out of the net towards other grids and consumers.



For automatic metered connections, the actual consumptions are known in the Real Load Profile or RLP. For residential customers who are measured periodically, the consumptions will be estimated for the allocation process using the Synthetic Load Profile or SLP. The delta between the infeed and the outfeed of the grid are the losses. These losses then need to be attributed to the relevant market players.

## 1.9 Meter reading responsible

The meter could be considered the cash register of the utility company, and the speed, accuracy and quality of meter reading has an immediate impact on customer satisfaction. Depending on the market model, the meter reading responsible can either be a separate market player, or the tasks can be performed by the DGO for example.

The Meter reading responsible will dispatch his workforce on a daily basis, to collect the readings from all manually read meters. Secondly, they will also collect the readings of automatic meters. Once collected, all the values will then be sent to the correct supplier based on the data in a connection register or metering point administration database. It is the responsibility of the meter reading company, to keep this register up to date, based on the market messages which are exchanged between all the different market parties.

When a customer wants to replace his meter, for example to move from a single tariff product to a dual tariff, the meter reading company needs to update their database. Who will perform the actual meter change depends on local rules and regulations, this might be the responsibility of the meter reading company, the DGO or even the supplier.

Some topics to further explore are the different tools that allow customers to provide the meter readings themselves. You may also want to look at the different types of meter e.g. a single tariff meter vs. a dual tariff meter.

Challenges meter reading companies are faced with, are managing a labour intensive and thus also cost intensive process especially in sparsely populated areas. Alternative would be to use smart meters which can be read without a meter reading visit, yet local legislation does not always allow remote data collection due to privacy and security concerns.



**Topics to explore**

- Self service meter reading
- Single / dual tariff meter
- Automatic meter
- Smart meter

**Hot topics - Challenges**

- Labour intensive meter reading
- Privacy concerns

## 1.10 Regulator

The final market party to discuss is the regulator. In the past, there was a fairly straightforward market structure in which one company produced, transported and supplied energy to end customers. After deregulation, however, market structure is quite complex as several market parties are involved. This calls for somebody to monitor and regulate the market, the regulator.

Some tangible responsibilities of the regulator would be to provide licenses to the suppliers, generators and transmission and distribution companies.

Secondly the regulator outlines how and in which format messaging needs to take place between the different market parties. The regulator also has an important advisory role both to the government and to the customer. They can give advice on e.g. energy efficiency and how to reduce your consumption. They may also act as ombudsman for any disputes that can not be resolved with your supplier or DGO. In many countries the regulator would also set, or at least need to approve the price of the transmission and distribution tariffs. It is needless to say that the regulator's tasks are quite diverse and will vary depending on local conditions and legislation.

An interesting topic to explore would be how to compare the prices or tariffs of the different suppliers. Which tools are available to do so, and are these tools really comparing apples to apples?

When it comes to challenges you could say that due to its role the regulator is basically facing all the challenges of the other market parties. An interesting topic here would be for example the government approach towards promoting or funding the installation of solar panels by the residential customer.



	<b>Topics to explore</b> <ul style="list-style-type: none"><li>• Compare energy prices</li></ul>
	<b>Hot topics</b> <ul style="list-style-type: none"><li>• Government funding for green energy initiatives</li></ul>

## 1.11 Recap

To round off let's go through all the different market parties once again, beginning with those that can directly be linked to the distribution of energy. These would be the producer/importer, the Transmission Grid Operator, the Distribution Grid Operator and finally the supplier and the customer. On top of that we have also identified a balance responsible, a meter reading company and a regulator.