

Wheeling and net-metering of energy

What is wheeling?

Wheeling is the transportation of energy over the grid

- A term for the use of the grid to deliver energy over the grid from one party (seller) to another party (buyer)

Wheeling charges are tariff charges

- Payable by all users of the grid – both buyers and sellers of energy
- Also known as network charges, access charges, use-of-system charges
- Can be point-to-point or based on standard tariff charges

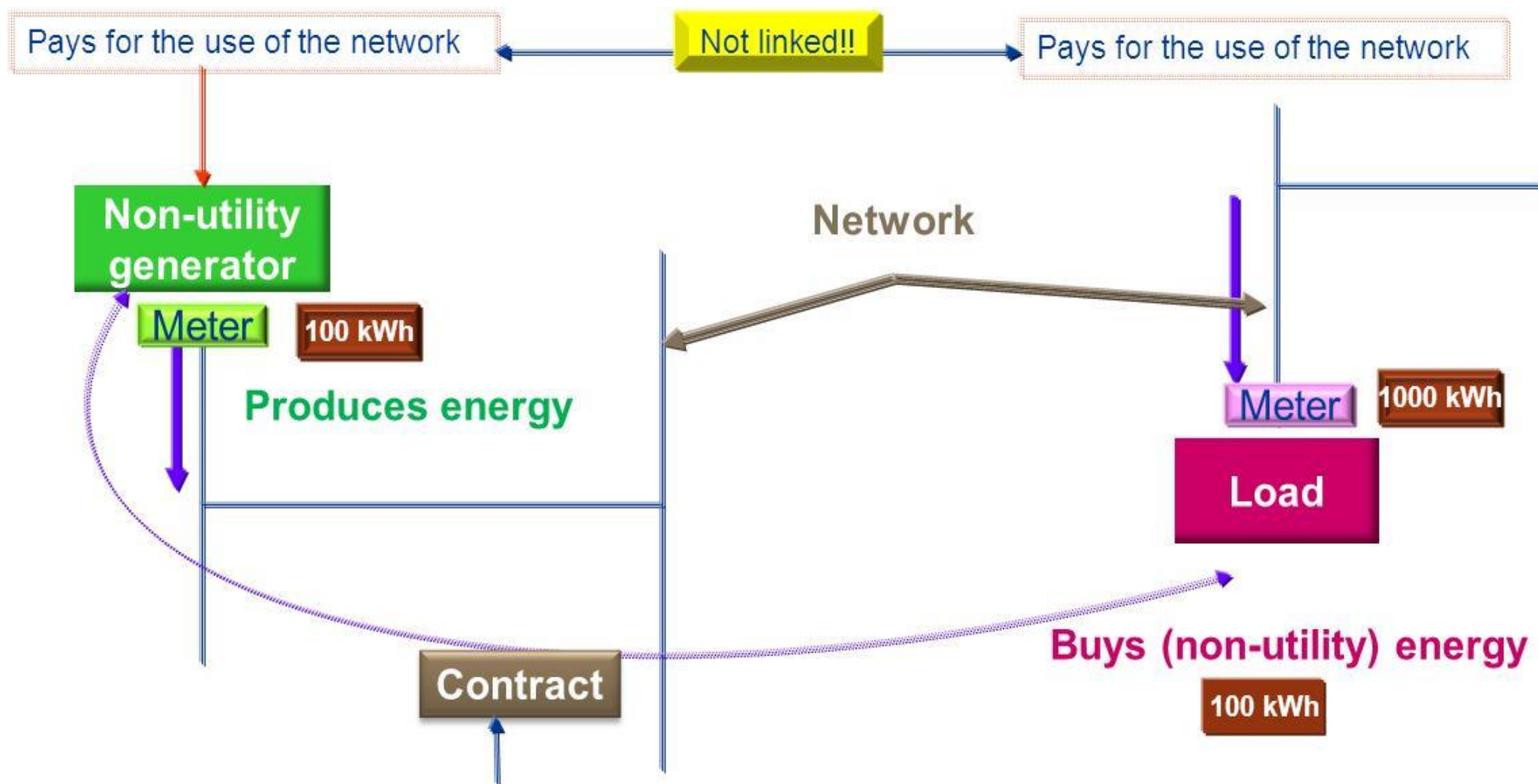
“Wheeling charges” - an old fashioned term?

- Probably derived from when electricity tariffs were not properly unbundled and network cost were recovered through c/kWh charges
- Usually used when energy not purchased through a market, or with international trade and/or bilateral trade

A wheeling transaction is the financial accounting treatment of the energy on the electricity bill

- Subtracts the value of the energy purchased through the wheeling transaction
- Does not deal with any actual flow of energy





Deals with a financial flow of energy – not actual flow

- Eskom Board approved Eskom's wheeling framework in 2009
- Nersa's "Regulatory rules on network charges for third-party transportation of energy" (March 2012) states
 - "Wheeling of energy shall be allowed, subject to the generator receiving its approvals from NERSA to sell to a third party and the signing of the network service provider's Connection and Use-of-System Agreement."
 - These rules set out how use-of-system charges will be raised for generators and loads, including customers that purchase/consume wheeled energy
 - Eskom has requested clarity from NERSA on a number of issues related to the rules but will calculate the use-of-system charges based on the principles contained in the rules

Misconceptions

The wheeling charges are additional charges and they make wheeling unaffordable!



The wheeling charges discourage open access and competition and unfairly penalise bilateral trade



There is no regulatory framework to allow wheeling!



Wheeling is very difficult to do!



Wheeling charges should not be raised as I am helping Eskom/SA/the municipality with generation!

Facts

Wheeling charges are not additional charges – all customers buying from Eskom or through bilateral trade will pay the same “wheeling charges



All customers that use the network are equitably treated – open access with non discriminatory charges are applied- including a fair contribution to network subsidies



Wheeling transactions are quite simple



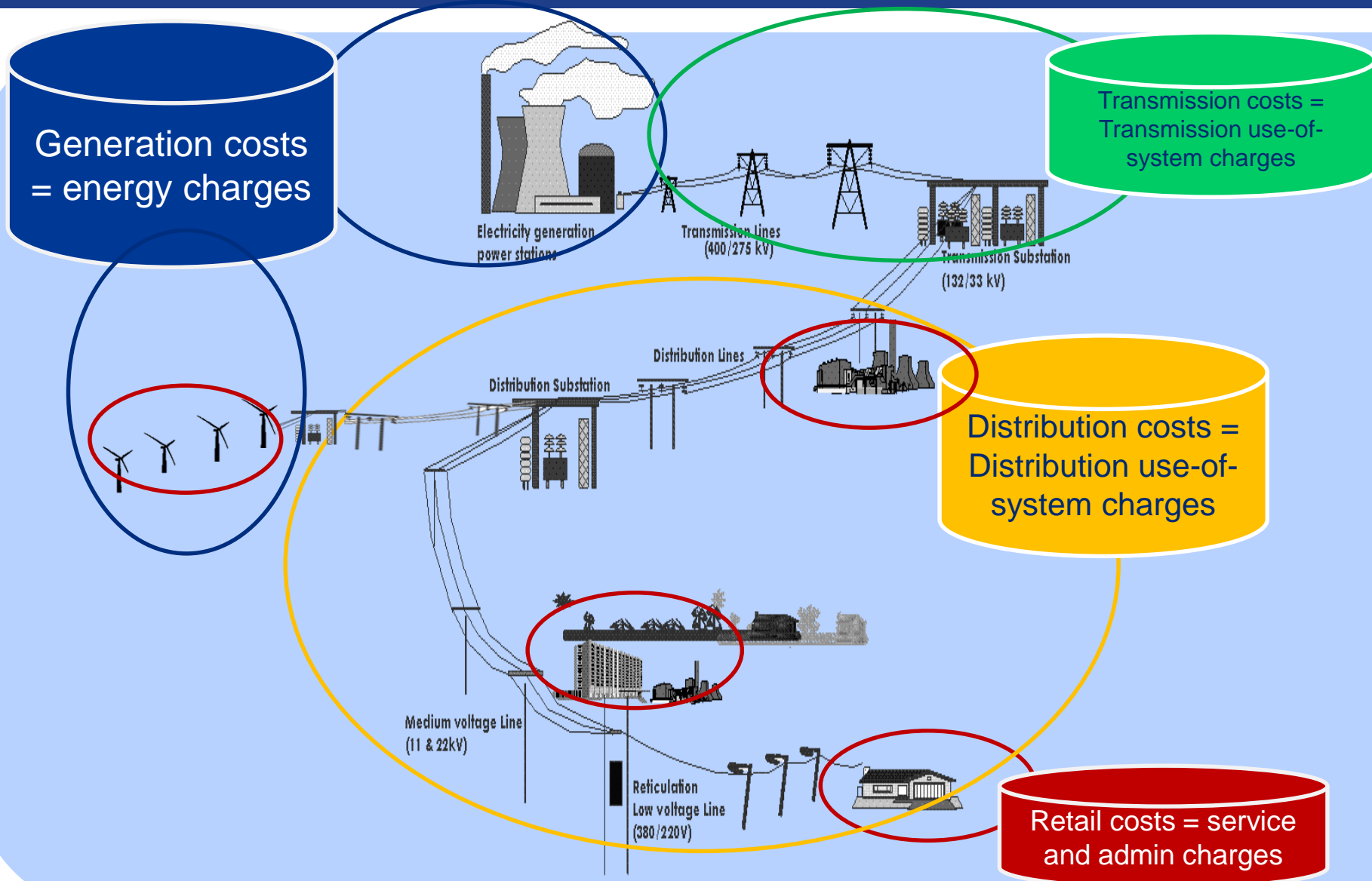
There is a regulatory framework – NERSA rules for the third party transportation of energy

BUT Not all distributors have unbundled tariffs or wheeling policies to allow wheeling and that can be used to determine wheeling charges



Wheeling deals with the use of the network and the cost of delivering the energy. It does not deal with energy sales or energy costs.

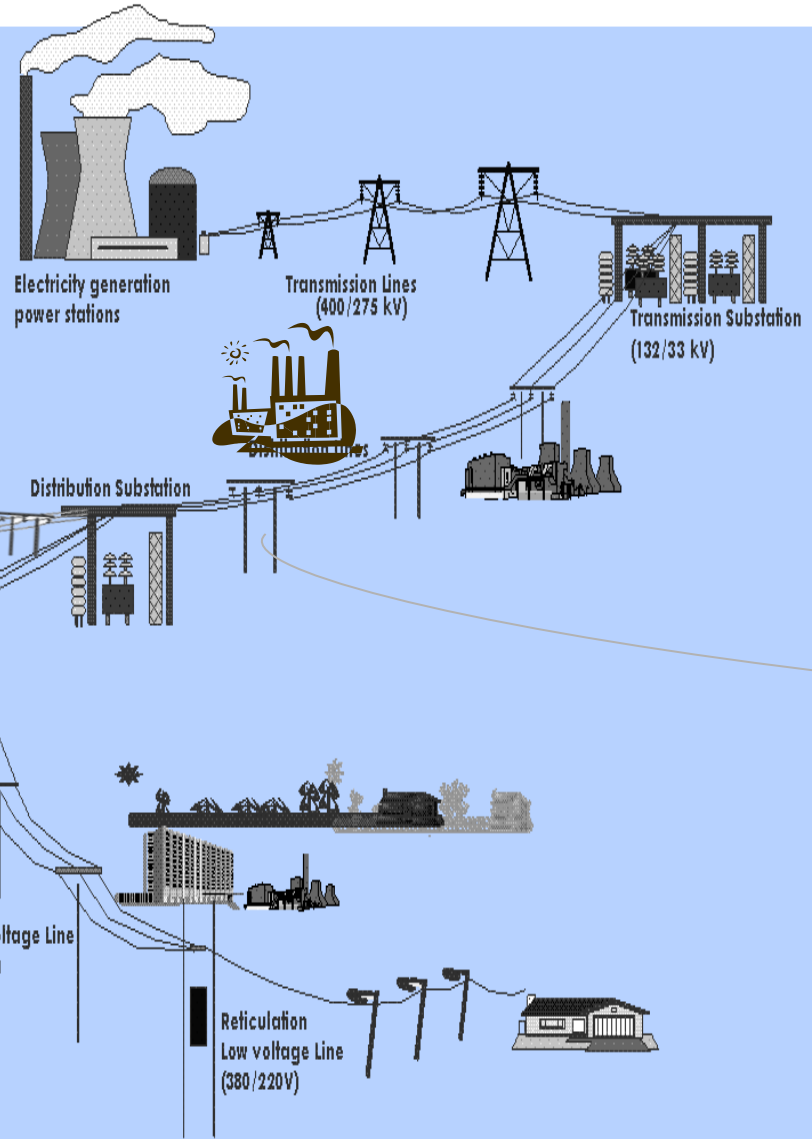
Understanding wheeling charges - The electricity supply chain and unbundling tariffs



- Each are separate cost components
- Buying electricity from a third party avoids only the energy portion of costs
 - Not the use of the grid
 - Or the cost losses

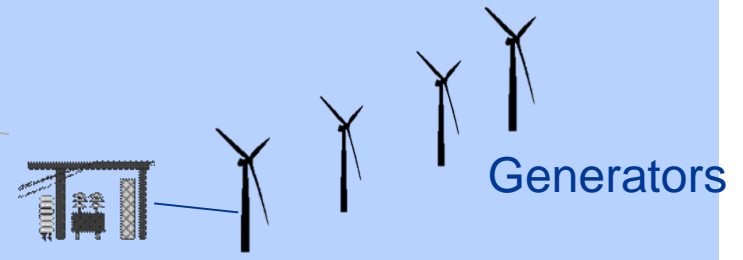
Recovery of costs through tariffs

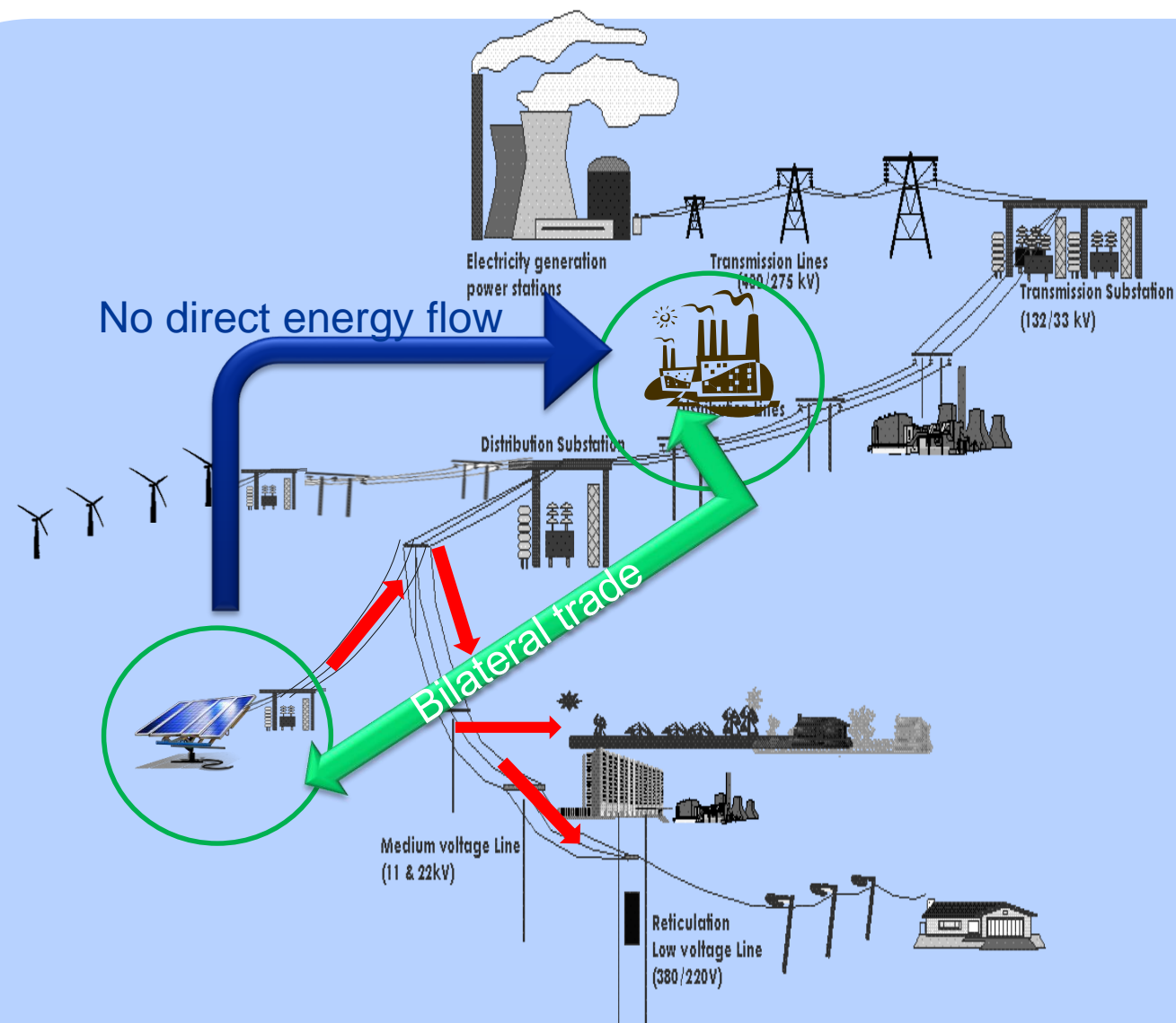
In Eskom the wheeling charges are called use of system charges or network charges
There are charges for generators and for loads



Use of system charges recover:
deep connection costs,
maintenance, operations,
refurbishment, strengthening,
customer services , admin,
ancillary services and subsidies

Cost of connection recovered through
connection charges (shallow) and use of
system charge (deep costs)



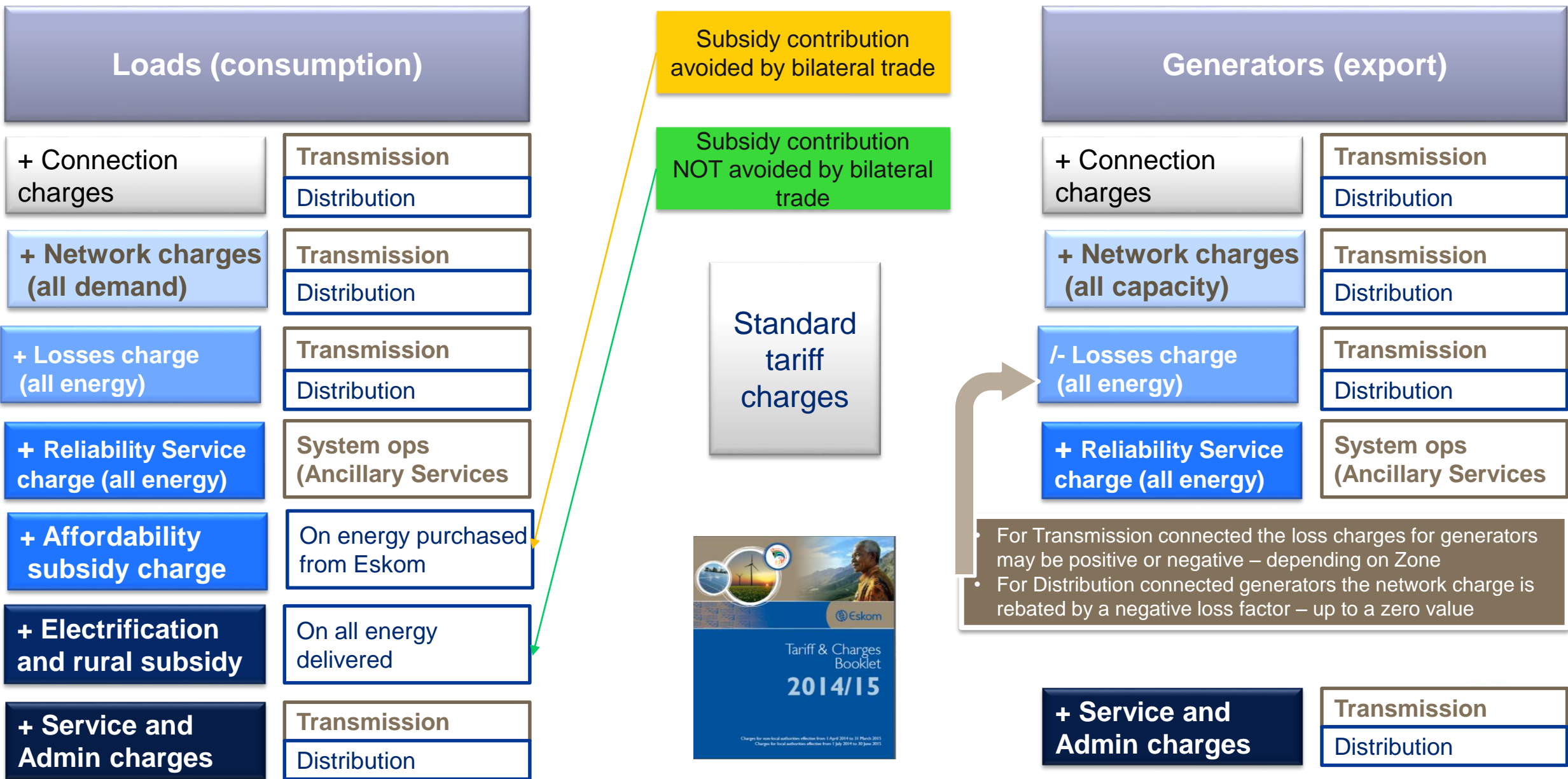


- Bilateral trade – not buying energy from Eskom /wholesaler
- Wheeling – using the grid to deliver the energy
- Energy flow – not direct between the parties (usually)
- Wheeling transaction – the process to account for energy not purchased from Eskom

- The generator must have an approved licence to generate and trade from NERSA
- The generator must sign the connection and use of system agreement.
- The account(s) will be adjusted in terms of Eskom's policy on the reconciliation of accounts
- The third party access will be implemented initially up to an overall limit of 300 MW (as Nersa's rules)
- Not applicable to generators connected at low-voltage (<1 kV)
- The System Operator may contract with non-Eskom Generators to provide reserves and other ancillary services.
- All third party access allocations shall be made on a calendar month basis.
- Banking will be allowed under certain conditions

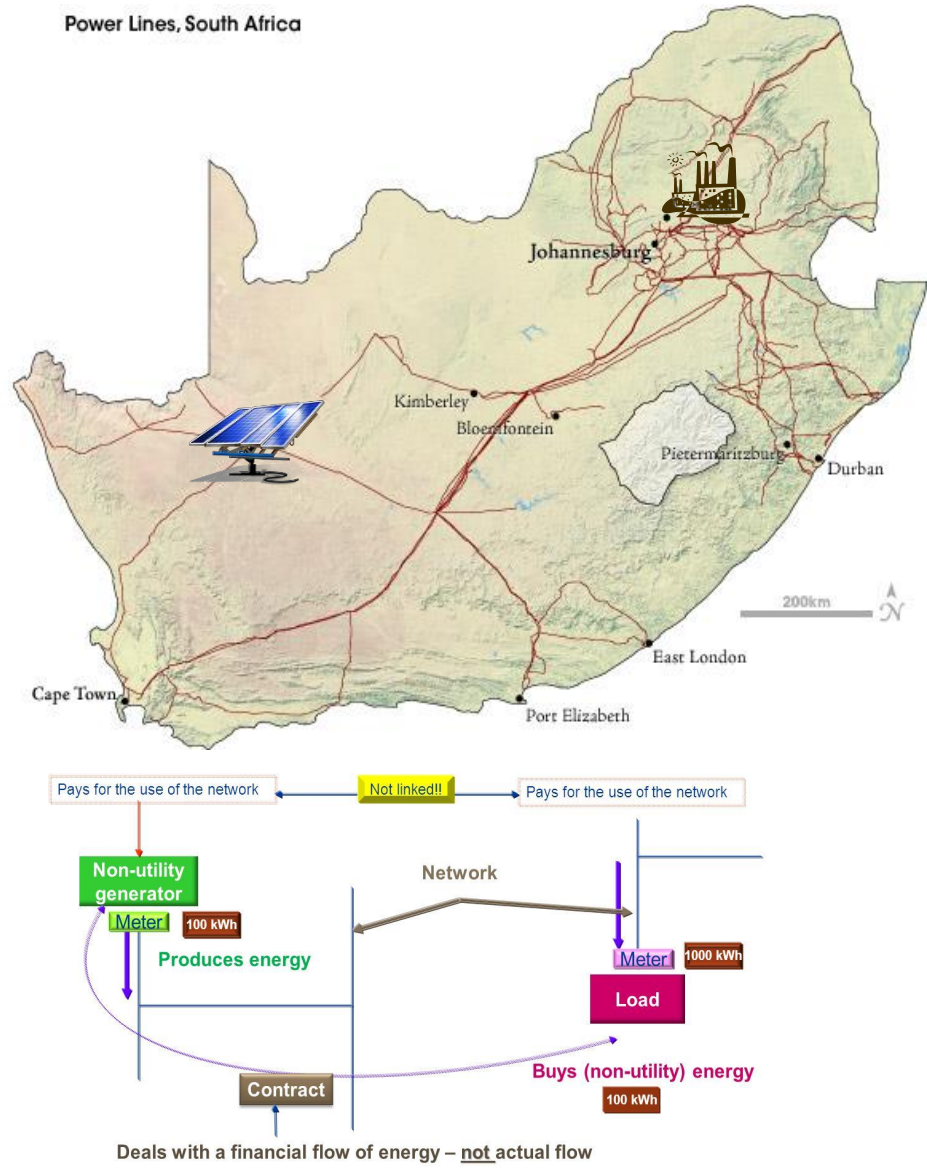
- Use of system charges are payable whether wheeling occurs or not
 - These charges are based on a cost of supply study done by Eskom and approved by Nersa
- The incremental costs attributable to the wheeling transaction are:
 - The cost of losses of the energy wheeled
 - Plus an administration charge to cover the additional service transaction on the bill
 - Less the affordability subsidy not raised on the wheeled energy
 - The network charges and reliability service charge (for the provision of ancillary services) are not avoided by a wheeling transaction
- Subsidies
 - Subsidies – where the tariff is lower than cost – funded by large power user tariffs
 - Network subsidies - not avoided through the use of the network
 - Otherwise discriminatory access to the network – equity to all users and not impacting the tariffs of customers that buy energy directly from Eskom
 - Nersa rules allows for avoidance of affordability subsidy – related to high price increases and contributing to the tariffs of low consumption residential customers

Use of system charges payable for use of the network by loads and generators



How will a wheeling transaction work?

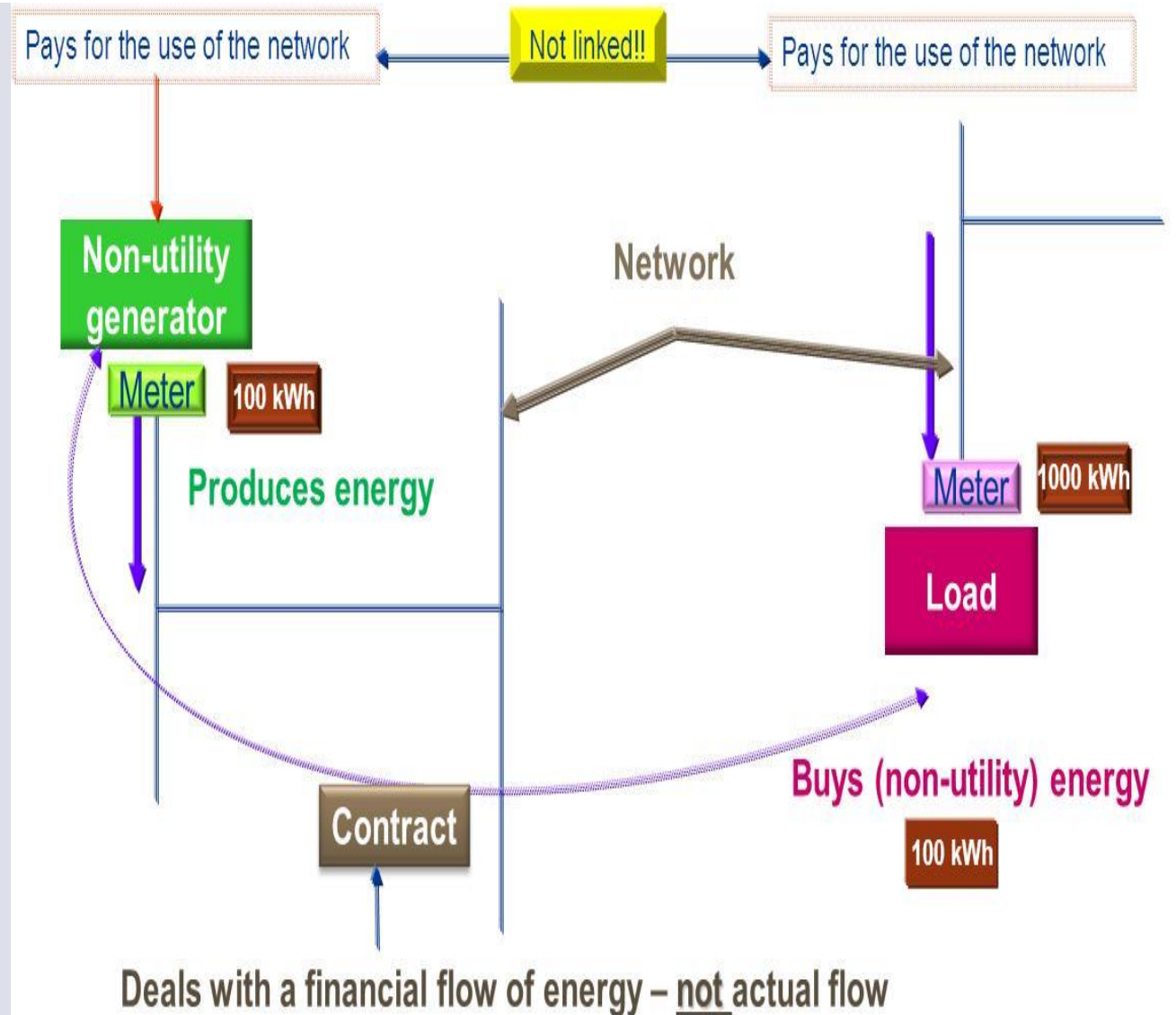
- ## Seller
- Measure generator export and allocate to buyer
 - Seller pays use of system charges for a generator connection



- ## Buyer
- Credit buyer with the energy produced at a rate excluding losses
 - Losses payable at standard tariffs loss factors – not on actual distance between load and generator
 - Affordability subsidy only payable on Eskom supplied energy
 - Electrification and rural subsidy payable on all delivered energy
 - An admin charge is raised for the transaction
 - All use of system charges payable on energy delivered for the capacity used and reserved on the network
 - No separate standby charges are payable
 - Reliability service charges payable on all energy delivered
 - Banking is allowed under certain circumstances
 - 4) In future there may be balancing mechanism to ensure effective and fair day-ahead scheduling by all generators by the System Operator

How the reconciliation of energy is done for a wheeling transaction

- 1) The energy produced by the generator is measured on a time-of-use basis and allocated to the buyer(s) as agreed.
- 2) The amount of energy allocated is adjusted on the customer's bill at the Megaflex time-of-use energy rates, less losses and reliability service charges.
 - Losses and reliability service charges are excluded as these are use-of-system charges
- 3) Eskom will supply any energy not provided by the Generator, in terms of the supply agreement signed with Eskom.



Reconciliation and costs for the buyer



Example - Buyer's account reconciliation for purchased wheeled energy (high demand season)

Assumptions				Legend
- Notified maximum demand (kVA)	100,000			Lookups
- Maximum demand (kVA)	80,000			Inputs
- No. of days in high demand season	92	Loss factors		Selection
- Supply voltage	: 66kV & ≤ 132 kV	1.0611		
- Transmission zone	≤ 300 km	1.0107		
- Munic	No			
- Main account	Yes			
- Size of supply	Key customers			
Calculations				
		High Demand Season		Charge
Network charges	kVA	R/kVA		
Transmission network charge	300,000	5.63		R 1,689,000
Distribution network access charge	300,000	4.11		R 1,233,000
Distribution network demand charge	240,000	7.61		R 1,826,400
LV subsidy charge	300,000	10.14		R 3,042,000
A) Total network charges				R 7,790,400
Total Energy through customer meter				
(High-demand season)	kWh	c/kWh		Charge
Peak consumption	35,328,000	210.56		R 74,386,637
Standard consumption	67,123,200	63.78		R 42,811,177
Off-Peak consumption	74,188,800	34.64		R 25,699,000
b₁) Sub-total	176,640,000	80.90		R 142,896,814
Adjustment for energy wheeled and purchased from an IPP by the customer (-)				
(@ Megaflex/WEPSrates excluding losses)	kWh	c/kWh		(IPP energy)
Peak	6,624,000	196.35		R 13,006,224
Standard	22,080,000	59.47		R 13,130,976
Off-Peak	15,456,000	32.30		R 4,992,288
b₂) Sub-total	44,160,000	70.49		R 31,129,488
B) (b₁-b₂) Net Energy (may never be < 0 unless banking)	132,480,000	84.37		R 111,767,326
Reliability service charge on Total energy	176,640,000	0.27		R 476,928
Reactive energy charge	0	10.15		R 0
Electrification and rural subsidy charge (on Total energy)	176,640,000	5.62		R 9,927,168
Affordability subsidy charge (on net (Eskom) Energy)	132,480,000	2.24		R 2,967,552
Service charge	Days	R/day	Service agreements	
Administration charge		R 144.18		R 13,265
		R 90.23		R 16,602
C) Total other charges				R 13,401,515
Total excl VAT				R 132,959,241
VAT				R 18,614,294
D) Total account				R 151,573,535

Cost of losses for energy wheeled (high demand season)	kWh wheeled	c/kWh	Rand
Peak consumption	6,624,000	14.21	R 941,270
Standard consumption	22,080,000	4.31	R 951,648
Off-Peak consumption	15,456,000	2.34	R 361,670
Total cost of losses high demand season	44,160,000	5.11	R 2,254,589

Will depend on load factors and profiles of generator and load

Summary of costs for the load	High demand
Total energy through meter	176,640,000
Total energy purchased from IPP	44,160,000
Eskom account without bilateral trade	R 165,069,612
Eskom account with bilateral trade	R 132,959,241
Difference (avoided cost of buyer)	R 32,110,371
c/kWh value of avoided cost of buyer	72.71
c/kWh saving on the Eskom bill	18.18
Wheeling cost (losses+admin charge -affordability subsidy charge)	R 1,273,706
c/kWh value of wheeling cost	2.88

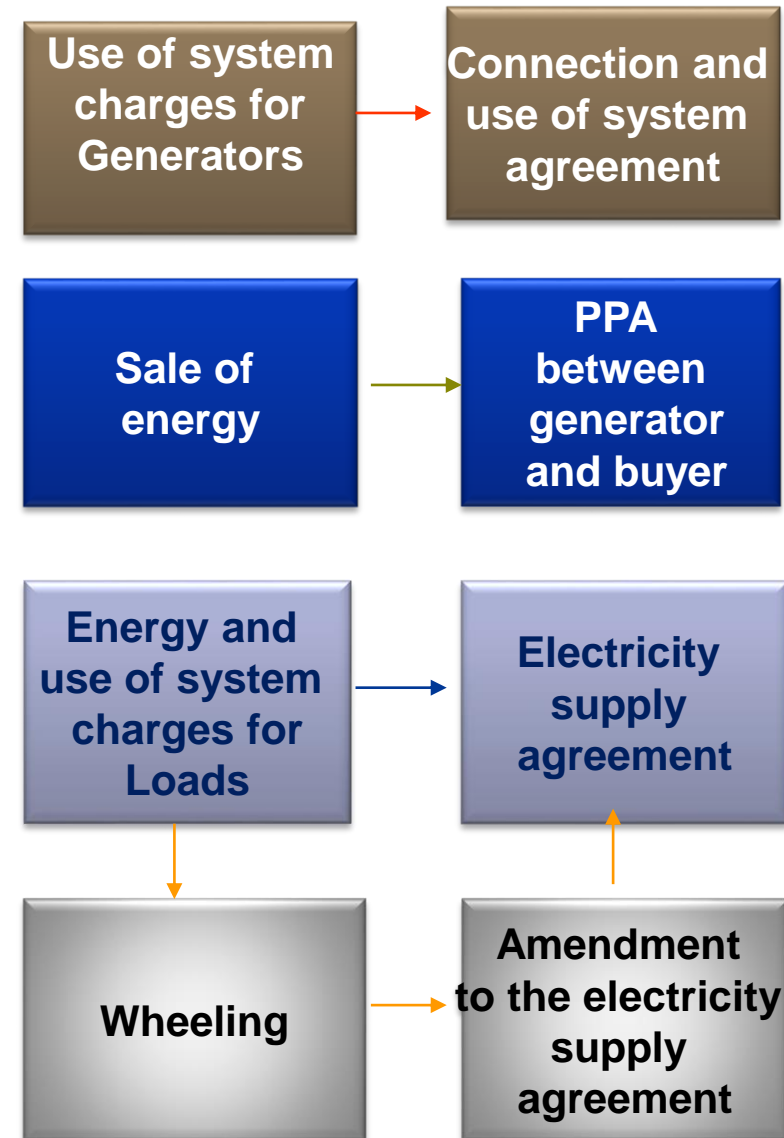


Example of charges for the generator

Generator	
Voltage	$\geq 66\text{kV} \ \& \ \leq 132 \text{ kV}$
Transmission zone generator	Vaal
Distribution zone generator	$\leq 300 \text{ km}$
	High demand
Generator GUoS	R 138,475
Energy produced	44,160,000
c/kWh cost of GUoS	0.31

Contracts required

- The generator will contract with the network provider to provide network services. The network provider will raise charges for these services.
- The generator will contract with the entity purchasing the energy through a PPA and this may be with Eskom, a third party or for own generation.
- If the energy is sold to a third party, the electricity bill must be adjusted for the wheeled energy through a supplementary contract. The customer will pay the standard tariffs associated with the cost of delivering the energy.
- All of the above transactions are separate contracts and deal with different issues.



Eskom has a current policy for larger MV connected customers with own generation to allow offset of energy exported.

- Must have a “legal” grid connection i.e. application, quote, payment of connection charges (if any), signing of the connections and use of system agreement
- These generators are identifiable, there are technical standards in place and the metering is capable of measuring TOU and bi-directional flow.
- The tariffs are unbundled to reflect fixed and variable costs
- The policy provides for net-billing for the energy exported
- This offset is done for energy costs only and at a rate that is closest to the cost of energy i.e. the Megaflex/Ruraflex energy rates
- There is no premium given for the energy exported

This has to still be developed for LV connected small scale embedded generators

- Nersa is the process of developing a consultation document
- Safety concerns
- Developments of standards and SANS compliance
- Administration, billing and metering – costs and time to implement depending on solution
- Tariffs and revenue recovery

Generators at times may generate more energy than is consumed either at their own plant or by their contracted wheeling buyer within a specific month and may wish to “bank” this energy.

Eskom’s policy on banking is:

- For generators above 1 MW
 - Shall be limited to infrequent and inadvertent over-generation relative to the associated load, i.e. not every month or more than 2 consecutive months.
 - The customer should demonstrate that it will generally absorb the generated energy itself or deliver to another load via wheeling to qualify for banking.
 - All banking arrangements above 1 MW must be approved on a case-by-case basis by an Energy Banking Committee.
- For generators < 1 MW
 - Banked energy shall be restricted to be never more than actual annual consumption (must be a net-consumer and not a net-generator over a period of 1 year). Banking will be refused in times when the generator’s maximum export capacity is exceeded unless permission has been obtained to do so.
- The consumer/buyer of the energy will bank the energy and not the generator.

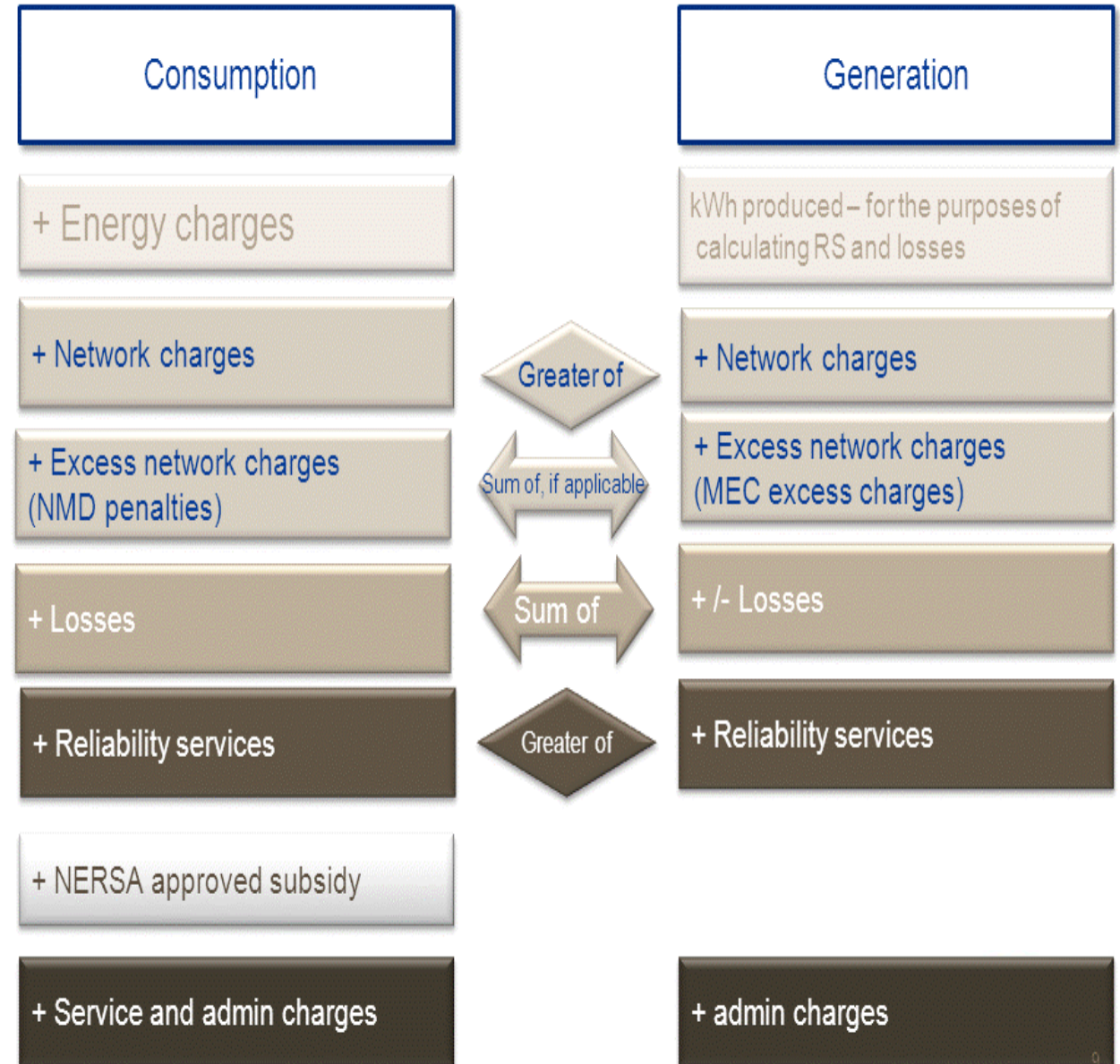
- Rights of the System Operator under banking conditions
 - The rights of the System Operator to dispatch shall be in compliance with the Scheduling and Dispatch Rules of the Code.
 - If either the generator or the load is not available for more than 24 hours the System Operator must be informed.
 - The System Operator under such circumstances may limit the amount of energy permitted to be banked or issue an instruction to not credit the energy banked.
 - Banking will not be allowed where the power system is placed at risk by “dumping” energy at times when not required by the System Operator or requiring other generators to operate sub-optimally.
 - In cases where the banking of energy places the Eskom grid/system at risk, then this would be considered an emergency condition and it will be necessary to issue instructions to the generator to reduce its generation. The integrity of the national grid should be of paramount importance.
 - Where banking is approved for a customer, this does not enable a customer to avoid load shedding if general load shedding is in effect in the area.
 - Once critical peak day pricing is introduced, the banked energy cannot be redeemed during critical peak day periods.

- The month to month banking of energy will be treated as follows:
 - The excess generated energy that is banked will reflect as a credit on the customer's account.
 - The credit will be calculated based on the energy rates applicable in the peak, standard and off-peak periods during which the excess generation occurs. The credit will be applied to energy only and not to other charges.
 - The credit balance on the customer's account will reduce as and when the energy is used by the customer.
 - Any residual banked energy credit will be carried over to the following month.
- Energy generated but not consumed on a constrained day could in future be paid for by the System Operator. This specific issue is not dealt with further in the banking policy.
- Where due to an Eskom outage or fault the Eskom network is not available:
 - To provide supply to the load customer, but the generator is still able to generate and export onto the Eskom network, there will be no restrictions for the consumer of the energy on the amount of energy that is permitted to be banked, **OR**
 - To provide a connection to the generator, the buyer of the energy will be supplied by Eskom at the standard tariff rates.

- Charges
 - Banking will be an additional service offering and therefore an Administration Charge will be payable. to recover the costs of administering the banking process.
 - This Administration Charge will be the Miniflex charge applicable to the relevant capacity of supply but may in future be a rate determined by NERSA approval.
 - A once-off standard charge will be payable
- In cases where banking of energy occurs on a regular and/or continuous basis Eskom may opt to enter into a short-term (WEPS) PPA with the generator instead of allowing banking.
- Month to month banking only be applicable to MV, HV and EHV connected loads on TOU tariffs and profile metering.
 - For smaller LV connected customers a separate policy and procedure will be developed.
- All relevant provisions of the Consumer Protection Act and application of VAT where credits are provided will be adhered to.
- The conditions for month to month banking will be included in the electricity supply agreement or amendment to the supply agreement and will be subject to the signing of these agreements.

Megaflex/Ruraflex Gen – implemented 1 April 2015

- Where there is a generation facility, irrespective of whether the customer is predominantly a generator or a load, there may be both consumption and generation of energy at the same point of supply.
- The same network assets are used for the purposes of generating (transporting energy into the grid) and for consumption (importing energy from the grid).
- In order to avoid network charges being charged on both import and export a new tariff category is proposed - proposed name "Genflex"
- Based on Megaflex/Ruraflex and generator use of system charges





Nersa has set up an advisory group to review the third party transportation rules

Municipality to municipality wheeling framework must be accommodated

- No flow over the Eskom grid so cannot do a reconciliation of the bill – may need a contract for differences type approach

Use of system charges should be properly unbundled – not done so in the majority of distributors in SA

Are private wheeling arrangements accommodated under current legislated?

Nersa working on a net-metering framework for small scale generation



Wheeling and offset is allowed by Eskom subject to certain conditions
Charges are standard tariff charges
The method presented is simple to apply, uses the standard tariff loss factors and there are no “special” rates applicable – all users will pay the standard tariffs the same as any other customer.
There are policies and tariffs to facilitate wheeling and offset of energy
There are gaps in regulatory frameworks and legislation to allow private participation in the generation industry

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