A view into the energy company of tomorrow – proactive adaptation to the evolving landscape

Sicelo Xulu
Managing Director
City Power, Johannesburg
South Africa
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Global demand for electricity

Growth in electricity demand by region, 2012–40 (CAGR)

- Global average: 2.1%
- OECD: 0.8%
- E. Europe: 1.4%
- Latin America: 2.5%
- Middle East: 2.7%
- Africa: 4%
- Asia: 3.3%

Electricity generation in OECD and non-OECD countries


- World electricity demand expected to increase by > 75% over 2012–40 period; average growth rate of 2.1% per year
- The most dramatic growth in demand will come from Africa (4% CAGR) followed by Asia (3.3%).
### Meeting this demand


<table>
<thead>
<tr>
<th>Region</th>
<th>Power plant</th>
<th>Power T&amp;D</th>
<th>Gas T&amp;D*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>2,109</td>
<td>970</td>
<td>303</td>
<td>3,382</td>
</tr>
<tr>
<td>E.Europe</td>
<td>835</td>
<td>526</td>
<td>417</td>
<td>1,778</td>
</tr>
<tr>
<td>Middle East</td>
<td>479</td>
<td>273</td>
<td>241</td>
<td>993</td>
</tr>
<tr>
<td>India</td>
<td>1,227</td>
<td>788</td>
<td>70</td>
<td>2,085</td>
</tr>
<tr>
<td><strong>Africa</strong></td>
<td>776</td>
<td>848</td>
<td>241</td>
<td>1,865</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>4,180</td>
<td>3,536</td>
<td>588</td>
<td>8,304</td>
</tr>
<tr>
<td>OECD Americas</td>
<td>1,952</td>
<td>1,215</td>
<td>586</td>
<td>3,753</td>
</tr>
<tr>
<td>Non-OECD Americas</td>
<td>593</td>
<td>530</td>
<td>93</td>
<td>1,216</td>
</tr>
<tr>
<td><strong>World</strong></td>
<td><strong>12,151</strong></td>
<td><strong>8,686</strong></td>
<td><strong>2,539</strong></td>
<td><strong>23,375</strong></td>
</tr>
</tbody>
</table>

**Sources:**
- World Energy Outlook (WEO) 2014

### Drivers of capex

**Replacement cycle**

- Aging power stations
- Asset replacement Expenditure

**Environmental targets**

- Government-imposed environmental targets imply massive spend

**Demand growth**

- Power demand to grow especially in emerging markets

**Enormous Infrastructure investment of more than US$23.3t required globally in power and gas**
Coal still to be a dominant fuel source in 2040 with 31% of global generation, but a significant decline from its 40%-plus share today.

Natural gas-fired generation expected to maintain its 22%-24% share, which will still imply a huge expansion in natural gas absolute volumes.

The real global growth story of course is renewables, which are expected to overtake coal as the primary source of power generation by 2040.
New Capacity addition

New capacity additions by region, 2014–40

► Fossil fuels will still hold a dominant position, with renewables gaining ground

► Renewables will represent the lion’s share of new capacity installed over the next couple of decades in every region.

Source: IEA WEO 2014
Drivers of change
Key Drivers of Change

Utility business models universally are evolving with a distinct shift from delivering kWh to delivering grid services

Replacing power, gas and water assets

New talent and fresh thinking

New and powerful private entrants

Accommodation of changing landscape

Restructuring, reshaping and creating incentives

PV, Co-gen/tri-gen, Storage

Energy management solutions

Smart meters, “big data” and analytics

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Evolving Distribution Model

Using the grid to support distributed generation

New revenues need to be generated through integration of various distributed sources and reliable energy flows

Brown energy sales reduced

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Supply and demand options available to City Power

Technology options (with high level consideration of technical, economic and market potential)

- National grid
- Kelvin upgrade
- Ops. efficiency
- Demand management
- Energy Efficiency
- Demand response
- Fuel switching (gas)
- WTE & landfill gas
- Cogen and biogas
- Gas turbines
- Solar (PV and CSP)
- RE incl Wind
- Energy storage
- Other technology innovations including Joburg Water Hydro conduit generation
- Nuclear

Ownership options

- Utility owned
- Customer owned (own supply)
- Third party / customer owned (grid supply / wheeling)
- Partnerships (e.g.. PPP)

Opportunity to be utilised as an embedded or distributed solution

- Greener options

A combination of these sources leads to increased diversity in the supply mix and decreased net emissions.

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What’s in the headlines?
New Electric Car to Hit South African Market

Gross: Tesla's latest electric car would be available in South Africa, chief executive Elon Musk said on 31 March. The South African-born entrepreneur tweeted that the Model 3 would be sold in South Africa, India, Brazil and New Zealand, among other countries.

Adding several more countries to Model 3 order page tonight. Check for details, but will include India, Brazil, SA, SK, NZ, Sing & Ireland. — Elon Musk (@elonmusk) March 31, 2016...

Full Article

Enel rolls out version of Tesla home power kit in SA:

The renewable energy division of Italy’s main power utility, Enel Green Power SpA, has started deploying a version of Tesla’s home-power kit in South Africa. Bloomberg reported that this rollout initiative is to mitigate the effects of increasing electricity tariffs on South African consumers...

Full Article

Nersa releases reasons for 9.4% Eskom tariff hike

In a summary of its decision Nersa said that the the Regulatory Clearing Account (RCA) balance of R11.241bn would be recoverable from standard tariff customers, local Special Pricing Agreements (SPAs) and international customers in the financial year 2016/17. "The amount of R10.257bn would be recoverable from standard tariff customers for the 2016/17 financial year only; the average tariff for standard tariff customers increased by 9.4% for the 2016/17 financial year only..."
COJ’s evolving business of tomorrow
Defining the new business

Thoroughly maintaining existing core business functions will still be a priority for all utilities; should serve as a departure point for all business of tomorrow adaptations.

Optimising existing core business functions:
- Consistent service delivery
- Streamlined grid refurbishment, expansion and new service provisions
- Efficient billing and metering

Utilize the full basket of energy options (incl. DG) in financially ranked order; flexible loads to be integrated.
**Basket of Energy Options**

**Immediate**
- Load shedding mitigation
- Embedded GX policy
- Demand Response
- Kelvin
- Smart meter / Load Limiting
- Ripple Control

**Short term**
- IPP PV applications
- PPA MTN / ABSA
- Solar Water Heaters
- Demand Side Management
- Gas Turbines (OCGT)
- Own Rooftop PV

**Longer term**
- Renewable Energy tariff
- Rural Gas/PV systems
- Diesel Generation
- Battery Storage
- Independent Power Producers / Embrace Renewable Energies

**Structural Changes**

**Open Grid/Trading**

**Time of Use Tariffs**
- Smart tariffs
- 240
- 60
- 200
- 80
- 20
- 112
- 6

**City - Waste to Energy**
- City - Landfill Gas
- Electric Vehicles charging

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**Independent Power Producers / Embrace Renewable Energies**
- Structural Changes
- Open Grid/Trading
Cooperation between City policy and the private sector

Customer generation is viewed as future IPP partners; micro-sized and distributed within the City. The deeper the distributed generation penetration, the higher the revenue impact; CP revenue model and tariffs need to be transformed to more network and less energy charges.

Utility service offering is to provide grid for energy balancing and back-up services. Net metering cannot be supported without losing revenue; however City Power can offer avoided Eskom cost for the surplus that generators produce.
Complimenting Self-dispatched generation with flexible load

*Keeping pace with digital technology uptake is key to success...*

<table>
<thead>
<tr>
<th>Load Management is enabled by smart metering technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>On demand flexible loads are being created through load limiting and demand response programmes</td>
</tr>
<tr>
<td>Load profiles can be shaped by implementing dynamic pricing or time of use tariffs</td>
</tr>
<tr>
<td>Flexible load can be sold as an ancillary service in future, igniting an emerging electricity trading market</td>
</tr>
</tbody>
</table>

**Smart Meter investment is assisting in mitigating load shedding today; As more self-dispatched renewable energy is added (16 GW by 2030 – IRP 2010), this can be used for providing ancillary services.**

**Great potential for a new industry – home automation.**
Barriers for PV potential IPPs are only temporary

- Currently, queries around permitting AC/DC cables to cross erf boundaries, to sell directly to neighbours so as to improve the PV business cases
- Queries around higher grid feed-in tariffs to enable bankable PV solutions
- As soon as the LCOE of PV < cost of Eskom, these questions will disappear
- With an element of storage and TOU tariffs adopted with PV systems, customers stand to gain immensely
A promising future?
Though recent electrical energy sales were flat; growth is expected.

* Excludes Sandton, Soweto; Natural Gas represents piped gas from eGoli gas

Though recent electrical energy sales were flat; growth is expected.
1. Drivers of reducing demand in COJ
   - Price elasticity of demand (forcing efficient customers)
   - Changes to customer energy mix (distributed generation, gas)
   - Structural changes to economy (manufacturing to retail/services)

2. 6% energy consumption reduction vs 1% peak demand reduction

3. GDP growth is still positive in addition to influx of new population increasing the number of customers

4. Rebound in demand is however expected in light of the above
Evolving municipal revenue model

Tariffs will need to adapt; moving from volume based tariffs to fixed network charge focussed tariffs with energy charges transforming to a pass-through cost.

Key challenge for utilities is to engage and convince customers of the value of the grid and how utilities can empower their customers and meet their needs.

Municipalities to see the overall picture, not just electricity surpluses. Other key aspects as such economic growth, job creation, gas and heat energy reticulation etc. may stand to benefit. Customers with own generation are likely to remain in the municipality even though energy sales may reduce.
## New opportunities for the Municipal Distributor

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid availability services</td>
<td>to provide backup and load balancing for customer PV systems on 51 overcast Gauteng days</td>
</tr>
<tr>
<td>Provide access to flexible loads or DSM</td>
<td>as an ancillary service to the System Operator (Eskom) in support of 16 GW RE by 2030</td>
</tr>
<tr>
<td>Green energy trading (willing seller willing buyer); Sustainable Wheeling tariffs</td>
<td></td>
</tr>
<tr>
<td>PV customers as micro-IPPs at a price &lt; Eskom with CPI related increases only; Explore options such as rooftop leasing, installation advisory services, etc.</td>
<td></td>
</tr>
<tr>
<td>Facilitate new generation installed with new load</td>
<td>(special network tariffs for new generation coupled with new load to unlock development)</td>
</tr>
<tr>
<td>Energy reticulation services (gas, heat, electricity) and combination thereof</td>
<td></td>
</tr>
</tbody>
</table>

**Transition to the energy company of tomorrow while empowering its customers**

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