CCRED CENTRE FOR COMPETITION REGULATION AND ECONOMIC DEVELOPMENT

UNIVERSITY OF JOHANNESBURG

Policy Brief, March 2018

Structural transformation: The impact of municipal electricity pricing policy on the foundry industry

Industrial Development Think Tank: Policy Briefing Paper 4[1]

Lauralyn Kaziboni, Zavareh Rustomjee and Ian Steuart

The bias in electricity prices between and among municipalities and Eskom has emerged as an important impediment to the growth of the metals, machinery and equipment value chain. Excessively priced electricity reduces the competitiveness of local cast products, and encourages local machinery and equipment manufacturers to import cast components that can be produced locally. Metal cast products, manufactured by foundries, are a key input in the production of a range of high-value downstream products such as autos, pumps, valves, and mineral processing and earth handling equipment. Foundries are therefore both the backbone of the manufacturing industry and its bellwether, and their strategic significance should not be underestimated.

Since the early 2000s, the foundry industry has witnessed a slow and steady decline. The number of both ferrous and high pressure foundries declined by 28% and 19% respectively between 2007 and 2016 (Table 1; Annexure 1). The number of non-ferrous sand, gravity and low pressure foundries also declined by 53% over the same period. Foundry closures have

resulted in job losses, with direct employment declining by 6,000 between 2003 and 2016. [2]

The main decline seems to have been driven by the 2008 financial crisis and/or rapidly escalating electricity prices since 2007.

Input costs play a big role in the competitiveness of the industry. Different from India and Brazil where energy and labour costs together constitute 27% and 43% respectively, in South Africa this proportion is closer to 50%. Equipment costs in South Africa are also high (14.5%) compared to comparator countries that range around 8%. Of particular note are energy costs that are between 8.5% and 15% for comparator countries, while in South Africa energy costs stand at 16% (Table 2: Appendix 1). Such high energy costs are not only eroding the profit margins but are also directly contributing to the inability of the industry to compete with casting imports from India and China Consequently, high levels of import penetration are prevalent in this industry.

[1] The Industrial Development Think Tank at UJ is housed in the Centre for Competition, Regulation and Economic Development, in conjunction with the SARChi Chair in Industrial Development, and supported by the DTI which is gratefully acknowledged. This paper reflects the views of the authors alone and not of the DTI or any other party.

[2] The number of job losses may have been rampant post-2007, when most of the foundry closures occurred.

Quantifying the impact of electricity pricing

Over 80% of the 165 foundries operating in South Africa today obtain electricity from their respective municipality. Of these, more than half are located in the Ekurhuleni Metropolitan Municipality. The Ekurhuleni tariff is therefore a good comparator to use to understand the impact of differentiated electricity pricing between municipalities and Eskom. Tariff structures differ between municipalities, and between municipalities and Eskom.

An analysis[3] was undertaken to calculate the electricity costs for hypothetical different sized foundries using comparable municipal versus Eskom tariffs (Ekurhuleni Tariff D and the Eskom NIGHTSAVE tariff) (see Annexure 2 for further detail).

The analysis shows that a typical medium to large-sized foundry that receives its electricity from its municipality can pay up to 30% more for its electricity per kilogram of output sold than if it obtained its electricity directly from Eskom. This represents roughly 4% of the foundry's total annual turnover. For a small-sized foundry, the difference in total electricity costs between Eskom and Ekurhuleni is 19% or 2% of total annual turnover. Foundries obtaining their electricity from municipalities rather than Eskom are therefore disadvantaged, impacting on competitiveness.

While foundries can make savings on their electricity bills by, for example, smoothing their electricity demand profile regardless of their supplier, the fundamental point of our analysis is that, by charging more for electricity, municipal suppliers are raising costs for high energy downstream industries that are central to industrial diversification.

The apparent municipal pricing anomalies are inherent structural features of a) the local government financing system; b) an inefficiently structured and fragmented electricity distribution infrastructure; and c) a legacy of historical underinvestment in distribution infrastructure.

Why are municipal electricity tariffs higher than Eskom's tariffs?

It is important for industrial policy practitioners to understand the systemic factors which give rise to the differential pricing structure between Eskom and municipalities.

Municipal electricity tariffs are a complex and highly contested issue. At the heart of the matter is the fact that the local government financing system is largely dependent on rents generated from electricity sales. This structural factor results in municipal-supplied electricity users having to pay higher tariffs than those charged by Eskom.

Eskom generates almost all electricity that is consumed in South Africa and distributes about 54% of electricity directly to domestic customers and large industrial end users, who are sometimes referred to as "key customers" and often located within municipal boundaries. The remaining 46% of electricity is sold by Eskom at wholesale prices to around 180 municipalities, who are accredited distribution license holders. These municipalities own and maintain their respective distribution infrastructure and supply electricity to domestic, commercial and industrial customers within their boundaries.

The National Energy Regulator of South Africa (NERSA) regulates electricity tariffs on a cost-of-supply basis. There are two main components of electricity tariffs: the demand charge (related to the cost of accessing and utilising the distribution infrastructure) and the energy charge. There is no common methodology used by municipalities to objectively determine the demand charge, whereas the energy charge is more closely linked to the bulk electricity tariff charged by Eskom. Many industrial users complain that municipalities unjustifiably increase the demand charge component of the tariff which is more difficult for NERSA to regulate.

Eskom submits its tariff increase application annually and once these are assessed and adjudicated, form the basis for NERSA's annual guideline for municipal tariffs (which are also based on cost-of-supply). All municipal license holders submit their proposed tariff increases to NERSA and hearings are held to assess tariff applications that deviate from the guidelines. NERSA utilises certain financial benchmarks in determining acceptable tariff increases. Very few municipalities have carried out independent cost of service studies, which would provide an objective basis for tariff determination, particularly the demand charge component. In the absence of this, NERSA benchmarks municipalities against Eskom's cost of service data and uses this as a guide for determining acceptable tariff increases. In

[3] Foundry Concepts, a private consulting company focusing on improving the competitiveness of the foundry industry, with assistance from the University of Johannesburg's Process, Energy and Environment Technology Station (PEETS), supported CCRED with the calculations.

many cases, municipal tariffs are much higher than enjoyed by the equivalent Eskom customer.

There is currently an unresolved dispute over the constitutionally-derived powers of municipalities to set electricity tariffs. Consequently, NERSA's power to sanction municipalities on electricity pricing has never been invoked or tested.

Notwithstanding the contestation over NERSA's jurisdiction to approve municipal pricing, NERSA is systematically applying the evolving annual tariff determination process. There is slow but apparent movement towards NERSA's objectives of cost-based tariffs but this is impeded by several factors, including failure by municipalities to submit timeous and accurate distribution financial, operational and tariff data to NERSA.

While municipalities are being encouraged to carry out cost of service studies, the lack of municipal capacity to manage infrastructure capital and operating systems is shown to be a historic one, which varies across municipalities. Numerous technical support initiatives by national government have been instituted over the past decade, but the problem remains unresolved.

Municipal financing structure

Reform of the municipal financing system is the jurisdiction of the Department of Cooperative Governance and Traditional Affairs (CoGTA) and National Treasury. Any attempt to interfere with their timelines is likely to be met with resistance, since the implication is that the electricity rents will have to be raised from elsewhere. In addition, Treasury's approach to municipal financing implies that it does not plan to decrease municipalities' dependency on electricity revenue in the future.[4]

Treasury believes that the challenge lies in the planning and allocation of financial resources by the respective municipalities in a more optimal and efficient way. Furthermore, Treasury makes the assumption that NERSA will be able to regulate municipal tariffs such that electricity users are not financing revenue shortfalls.

NERSA guidelines require municipalities to allocate 6% of tariff revenue to repairs and maintenance. Many municipalities have not been doing this and there are substantial and growing backlogs in infrastructure maintenance, which need to be dealt with. The Financial and Fiscal Commission (FFC), in its 17 October 2013 presentation to Parliament's Energy Committee projected that the municipal energy distribution infrastructure would collapse within 5 years should low levels of maintenance persist. FFC recommended that National Treasury should offer performance-based conditional grants for municipalities to encourage them to rehabilitate distribution infrastructure but, more importantly, stipulated that the grant conditions should include sanctions as a mechanism to boost performance. But, it appears that no provision has been made for rehabilitation of distribution infrastructure backlogs in the current MTEF, leaving the planning and allocation of resources to the respective municipalities. Instead, the 2018 National Treasury Budget Review announced plans to reduce the municipal infrastructure grant, acknowledging that distribution infrastructure projects "*will be postponed as a result of the adjustments*".[5]

This suggests that to avoid the collapse of distribution infrastructure, municipal tariffs will need to be raised substantially in future.

Policy attempts to improve electricity distribution efficiency through rationalisation

The 1998 White Paper on Energy Policy identified the inefficiencies in having Eskom plus 180 municipalities providing separate and fragmented distribution services to electricity users, and proposed the rationalisation of distribution into six wall-to-wall Regional Electricity Distributors (REDS). The attempts to implement this policy reached a climax in 2009/10 with proposals to change the constitution to allow for central intervention under certain special circumstances. Ultimately the project to achieve economies of scale in electricity distribution failed for a variety of reasons, such as the dependence of the local government financing system on electricity rents.

In December 2012, Cabinet endorsed a replacement process (Approach to Distribution Asset Management-ADAM) aimed at identifying and addressing municipal distribution infrastructure blockages. It is clear from the recent reports from the Department of Monitoring and Evaluation that the municipal distribution asset infrastructure backlogs are not being reversed and that this is likely to be the basis of an electricity crisis. It is

[4] See the Revenue Adjustment factor in the National Treasury (2018:p.97), Division of Revenue Bill. Available here: http://www.treasury.gov.za/legislation/bills/2018/Division%20of%20Revenue%20Bill%20B2%202018.pdf

[5] National Treasury (2018:P76), Budget Review available here http://www.treasury.gov.za/documents/national%20budget/2018/review/FullBR.pdf

not clear how the ADAM process is to be implemented or funded. It does not appear from the current Estimates of National Expenditure, that the Department of Energy has budgeted for continuing the funding of ADAM and it is unclear how the distribution infrastructure rehabilitation programme will be funded in future years. The Electricity Distribution Industry (EDI) restructuring programme was previously funded through a component of the tariff, but it is not clear whether this will be the case in the future.

Municipal electricity pricing recommendations

This study proposes four policy recommendations, with short- and long-term horizons:

Policy makers should develop a detailed real-time monitoring and evaluation system of electricity tariffs and the state of electricity distribution infrastructure in Eskom and municipal service areas

The Department of Water and Sanitation's Blue Drop[6] and Green Drop[7] monitoring and evaluation system provides an accessible picture on the water quality and sanitation infrastructure condition and trends at municipal level. It is recommended that their web-based IT system be adapted to show a similar benchmarked picture of the Eskom and municipal electricity distribution system including tariff schedules (demand and energy charges), funding backlogs, budgeted and actual maintenance and capital expenditure, planned and unplanned outages, etc. Distribution license conditions require municipalities to submit such information to NERSA annually through the so-called "D-Form process".

Industrial policy custodians should work closely with NERSA processes that are aimed at improving data integrity and accuracy, and institutionalising the annual cost-based tariff determination system. Together, industrial policy implementers and NERSA can also monitor and publicise the status of individual municipal electricity infrastructure and the extent to which individual municipalities are investing in distribution infrastructure, so that industrial investors are made aware of the energy pricing risks they face in certain municipalities.

A Special Pricing Agreement for energy-intensive sectors

Given that South Africa's generation surplus will rise substantially over the next decade, it is very likely that special pricing agreements (SPA) will again be considered in order to increase Eskom's asset utilisation rates. Should such programmes be developed, it is imperative that the Department of Trade and Industry, Economic Development Department and other industrial policy custodians be centrally involved in the architecture and the targets of the SPAs. Appropriate conditions can also be applied, including conditions of passing the rents through to downstream labour-intensive sectors (such as foundries). It is equally important that such conditions be enforced more robustly than has been the case in the past.

Improve the efficiency and competitiveness of municipal electricity supply

Improving the efficiency and competitiveness of municipal electricity supply/distribution is a critical factor in raising South Africa's industrial competitiveness. Industrial policy custodians have very little direct influence on this. However, they are in a powerful advocacy position to accelerate other processes that can have impact.

Industrial policy makers need to engage with and understand and influence National Treasury and CoGTA plans regarding the local government financing system. Industrial policy makers should emphasise the adverse economic impact of the structural dependence of municipal financing on electricity rents and on how the advent of new technologies are already undermining this financing system.

More recent research suggests that new technologies such as distributed generation (e.g. rooftop PV panels), improved battery storage systems and "smart-grids"[8] are likely to influence the structure and cost of distribution infrastructure and widespread adoption of these technologies are likely to undermine the current system of local government financing.

Industrial policy makers should encourage the use of Treasury's budget disciplining policy instruments, including conditional grants, in order to accelerate the move to municipal cost-based tariff setting.

Finally, industrial policy makers need to obtain clarity from Treasury and the Department of Energy on how

[6] http://ws.dwa.gov.za/IRIS/mywater.aspx
[7] http://www.dwaf.gov.za/Dir_WS/GDS/
[8] http://www.sasgi.org.za/
http://www.ee.co.za/wp-content/uploads/2017/12/Smart-Grid-Vision-Document-2017.pdf

distribution infrastructure rehabilitation (ADAM) is to be funded and how ADAM or its successor may need to be reviewed in the light of the adoption of new technologies.

Relocation incentives for energy-intensive firms/Limit investment incentives to municipalities with better maintained infrastructure

Since it may take some time before the realisation of some of the structural changes proposed above, policy custodians involved in administering investment incentives should consider preferentially promoting energy-intensive investments only in those municipalities with more reliable electricity distribution infrastructure and in municipalities which offer more sustainable and competitive electricity tariffs. In addition, consideration could be given to a specific relocation incentive for those firms that are likely to fail due to unjustifiably high municipal electricity costs.

Annexure 1

Table 1: Industry structure by foundry type

	2003		2007		2016		% change, 03-07	% change, 07-16
	No.	%	No.	%	No.	%		
Ferrous (iron & steel)	110	41%	110	42%	79	48%	0%	-28%
Non-ferrous sand, gravity, low pressure casters	117	43%	119	45%	56	34%	2%	-53%
High pressure die casters	36	13%	32	12%	26	16%	-11%	-19%
Investment casting	7	3%	4	2%	4	2%	-43%	0%
	270	**100%**	**265**	**100%**	**165**	**100%**	**-2%**	**-38%**

Source: SAIF (2015, 2017); own calculations

Table 2: Comparative cost structure

	SA	India	Brazil	China	Russia
Overheads	8%	15%	10.5%	3%	12.8%
Equipment	14.5%	8%	9%	8.5%	7.2%
Labour	33.5%	12%	32%	8%	21.4%
Energy	16%	15%	11%	8.5%	13.4%
Material	28%	50%	37.5%	72%	45.2%
Total	100%	100%	100%	100%	100%

Source: NFTN (2015)

Annexure 2

The relevant tariff structures for foundries located in Eskom and Ekurhuleni are presented in A.1.

The Ekurhuleni municipally utilises time-of-use tariff structures applicable to consumption to shift load. The peak period rate is significantly higher than the standard and off peak rate, and in the winter months the difference is even more significant.

The Eskom NIGHTSAVE tariff utilises a time-of-use tariff structure on maximum demand, with a zero charge during the off peak periods, and a seasonal charge in the peak periods. It is specifically designed to shift energy consumption to the nightshift period. The combined maximum demand rates are R70.33/MVA in summer months, compared to a significantly increased rate of R244.48/MVA in winter months (an increase of 248%).

Based on Foundry Concept's model in A.2, the difference in base case electricity costs per kilogram sold for a hypothetical medium to large-sized foundry supplied by Eskom and the same foundry supplied by Ekurhuleni is 29% (column F in the table comparing Eskom and Ekurhuleni Night Save below), or roughly 4% of total annual turnover (column J). For a small-sized foundry, the difference in total electricity costs between Eskom and Ekurhuleni falls to 19% or 2% of total annual turnover.

In cases where installed capacity is much higher than maximum demand, the difference in total electricity costs per kilogram sold falls from 29% to 17%. The example highlights the cost of electricity in cases where there is a significant divergence between maximum demand and installed capacity. Having more capacity than you currently need may provide a cushion when orders pick up and may also enhance the value of your business when it comes to selling it on, but these future and uncertain benefits must be weighed up against the actual costs of paying for that unutilised capacity now.

Whether foundries receive their electricity directly from Eskom or not, significant savings can be achieved if medium-to-large sized foundries are able to optimise their maximum demand (scenario 2), i.e., avoid spikes in MVA over any given period. It is easier for more specialised foundries with a smaller product range to optimise their maximum demand requirements due to the similar metal demand per hour during the production month, as opposed to foundries with a larger, more diverse product range where the output per hour varies vastly.

In our example, foundries that are able to optimise their maximum demand would reduce their maximum demand charge per kilogram sold from 80c to 65c (or by approximately 19%) under the Ekurhuleni tariff and from 68c to 57c (approximately 16%) under the Eskom tariff. For a medium to large-sized foundry in Ekurhuleni, this would represent a saving of almost R2 million on their annual electricity charge.

That said, the current, low-demand environment is working against those foundries who are diversifying their product range in an attempt to stay afloat by including new products into their range that are not in line with their optimal production requirements. This makes optimal production planning much more difficult to achieve with resultant spikes in maximum demand and therefore higher electricity charges.

Improvements in melting efficiency and additional shifts are other ways in which savings can be realised. The energy required to melt one tonne of metal is influenced by the type of equipment and the condition of the equipment, the quality and density of the scrap metal as well as the operational practices of the foundry. In the example above, the saving accruing to a large foundry by reducing the energy required to melt one tonne of metal from 1450kWh to 1100kWh (scenario 3) is clearly illustrated in A.3. Total electricity cost per kilogram sold falls from R3.27/kg sold to R2.52/kg sold (a decrease of just under 23%). The impact of asset utilisation – operating two shifts, for example – is also clearly demonstrated in the example, highlighting once again the importance of unlocking additional volumes for foundries.

A.1. Tariffs

Ekurhuleni Tariff D > 1MVA				
	Small foundry		Large foundry	
	1 Jul 2017 - 1 Jun 2018		1 Jul 2017 - 1 Jun 2018	
	Summer	Winter	Summer	Winter
Maximum Demand Charges				
Maximum Demand Charge (highest in month)	60.92	60.92	56.42	56.42
Network Access Charge (highest, rolling 12 months)	36.55	33.83	33.83	33.83
Consumption Charges (kWh)				
Peak Usage	1.3801	3.7108	1.2782	3.4367
Standard Usage	0.9054	1.303	0.8392	1.206
Off Peak Usage	0.714	0.7856	0.661	0.7277
Administrative Charges				
Fixed Charge	2486.65	2486.65	3736.76	3736.76

Source: https://www.ekurhuleni.gov.za/thecouncil/tariffs

Eskom NIGHTSAVE					
		Small foundry		Large foundry	
		1 Jul 2017 - 1 Jun 2018		1 Jul 2017 - 1 Jun 2018	
		Summer	Winter	Summer	Winter
LOAD CHARGES (kVA)					
Related to Installed Capacity					
TX Network Capacity Charge	>500	7.28	7.28	7.09	7.09
Network Capacity Charge	≤ 300km, > 500V & < 66kV	14.51	14.51	5.18	5.18
Max Demand used in Peak Period (kVA)					
Network Demand Charge (Peak)	≤ 300km, > 500V & < 66kV	27.52	27.52	9.6	9.6
Energy Demand Charge (Peak)	≤ 300km, > 500V & < 66kV	28.3	202.45	27.27	195.08
Total charges related to Maximum Demand (kVA)		70.330	244.480	42.050	209.860
CONSUMPTION CHARGES (kWh)					
Energy Charge(usage)	≤ 300km, > 500V & < 66kV	0.508	0.651	0.502	0.6442
Ancillary Charge		0.004	0.004	0.003	0.003
Affordability Subsidy Charge		0.0287	0.0287	0.0287	0.0287
Electrification and Rural Subsidy		0.071	0.071	0.071	0.071
Environmental Levy Charge					
Total charges related to Consumption (kWh)		0.611	0.754	0.605	0.747
ADMINISTRATIVE CHARGES					
Admin Charge/Day		81.870	81.870	81.870	81.870
Service Charge/ day		181.660	181.66	181.660	181.66
Total Administration Charges		263.530	263.530	263.530	263.530

Source: http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Pages/Tariffs_And_Charges.aspx

A.2. Results

	Ekurhuleni D					Eskom NIGHTSAVE								
	A	B	C	D	E	B	C	D	E	F	G	H	I	J
Large Foundry (Installed capacity = 8 MVA; selling price = R25/kg)														
Base case	1	2.46	0.80	0.01	3.27	1.64	0.68	0.01	2.32	29%	12 859	12 098 564	321 480 000	4%
Reduce max demand	2	2.46	0.65	0.01	3.12	1.64	0.57	0.01	2.21	29%	12 859	11 588 399	321 480 000	4%
Increase efficiency (kWh / ton melted)	3	1.87	0.65	0.01	2.52	1.24	0.57	0.01	1.82	28%	12 859	9 038 924	321 480 000	3%
Improve yield	4	1.59	0.55	0.01	2.15	1.06	0.48	0.01	1.55	28%	15 115	9 038 924	377 880 000	2%
Additional shifts (3 shifts)	5	1.59	0.37	0.00	1.96	1.06	0.32	0.00	1.38	29%	22 673	13 045 242	566 820 000	2%
Small Foundry (Installed capacity = 1 MVA; selling price = R45/kg)														
Base case (day time)	1s	2.91	1.86	0.08	4.85	1.81	1.98	0.13	3.93	19%	733	678 522	32 994 000	2%
Increase efficiency (day time)	2s	2.21	1.86	0.08	4.15	1.38	1.98	0.13	3.49	16%	733	484 371	32 994 000	1%
2 Shifts	3s	2.21	0.93	0.04	3.18	1.38	0.99	0.07	2.43	23%	1 466	1 094 561	65 988 000	2%
Night shift; reduce connection V	4s	2.21	1.86	0.08	4.15	1.38	0.68	0.13	2.19	47%	733	1 438 203	32 994 000	4%
Costing at real capacity installed														
Large Foundry (Installed capacity = 42 MVA; selling price = R25/kg)														
Base case	1	2.46	0.80	0.01	3.27	1.64	1.07	0.01	2.71	17%	12 859	7 092 404	321 480 000	2%
Reduce max demand	2	2.46	0.65	0.01	3.12	1.64	0.96	0.01	2.60	16%	12 859	6 582 239	321 480 000	2%
Increase efficiency (kWh / ton melted)	3	1.87	0.65	0.01	2.52	1.24	0.96	0.01	2.21	12%	12 859	4 032 764	321 480 000	1%
Improve yield	4	1.59	0.55	0.01	2.15	1.06	0.82	0.01	1.88	12%	15 115	4 032 764	377 880 000	1%
Additional shifts	5	1.59	0.37	0.00	1.96	1.06	0.54	0.00	1.60	18%	22 673	8 039 082	566 820 000	1%
Small Foundry (Installed capacity = 1 MVA; selling price = R45/kg)														
Base case (day time)	1s	2.91	1.86	0.08	4.85	1.81	2.34	0.13	4.28	12%	733	417 042	32 994 000	1%
Increase Efficiency (day time)	2s	2.21	1.86	0.08	4.15	1.38	2.34	0.13	3.85	7%	733	222 891	32 994 000	1%
2 Shifts	3s	2.21	0.93	0.04	3.18	1.38	1.17	0.07	2.61	18%	1 466	833 081	65 988 000	1%
Night Shift; reduce connection V	4s	2.21	1.86	0.08	4.15	1.38	0.68	0.13	2.19	47%	733	1 438 203	32 994 000	4%

Key to Table A.2 Hypotheticals	
A = Scenario	*F = % Difference between Eskom and Ekurhuleni*
B = Consumption cost / kg sold	*G = Tons sold*
C = Maximum demand / kg sold	*H = Difference*
D = Administrative cost / kg sold	*I = Average turnover*
E = Total electricity cost / kg sold	*J = Savings as a percentage of sales*

Interpreting the table

The Ekurhuleni “Tariff D” and the Eskom “NIGHTSAVE” tariff are analysed under five scenarios for a typical large-sized foundry and four scenarios for a typical small-sized foundry.

A.3. Assumptions

For a large-sized foundry, the different assumptions for each scenario are as follows:

		1	**2**	**3**	**4**	**5**
a.	Tons per hour	8	8	8	8	8
b.	Efficiency	75%	75%	75%	75%	75%
c.	Working days per year	235	235	235	235	235
d.	Number of shifts	2	2	2	2	3
e.	Target kWh/ton melted	1,450	1,450	1,100	1,100	1,100
e.	Maximum demand (MVA)	8,000	6,500	6,500	6,500	6,500
f.	Maximum demand (highest in 12 months)	8,000	6,500	6,500	6,500	6,500
g.	Energy usage pattern – peak	15%	15%	15%	15%	15%
h.	Energy usage pattern – standard	42%	42%	42%	42%	42%
i.	Energy usage pattern – off-peak	43%	43%	43%	43%	43%
j.	Saleable castings	57%	57%	57%	67%	67%

For a small-sized foundry, the following assumptions apply for each scenario:

		1s	**2s**	**3s**	**4s[1]**
a.	Tons per hour	1	1	1	1
b.	Efficiency	75%	75%	75%	75%
c.	Working days per year	235	235	235	235
d.	Number of shifts	1	1	2	1
e.	Target kWh/ton melted[2]	1,450	1,100	1,100	1,100
e.	Maximum demand (MVA)	1,000	1,000	1,000	1,000
f.	Maximum demand (highest in 12 months)	1,000	1,000	1,000	1,000
g.	Energy usage pattern – peak	15%	15%	15%	15%
h.	Energy usage pattern – standard	42%	42%	42%	42%
i.	Energy usage pattern – off-peak	43%	43%	43%	43%
j.	Saleable castings	52%	52%	52%	52%

[1] *Scenario 4s has the same basic assumptions as Scenario 2s except that Scenario 2s is based on melting at night while Scenario 2s is based on melting during the day.*

[2] *Target kWh / ton melted refers to the energy required to melt one ton of metal. The figure used in the base case (scenario 1) is comparable to Russia and higher than most European foundries.*