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COST AND BENEFITS FOR CONVERTING COAL TO GAS BOILERS IN GAUTENG HOSPITALS BY 2024

STUDENT NAME: KHATHUTSHELO TSHILILO

CLUSTER: HEALTH

PROVINCE: GAUTENG

SAVINGS@WORK
GOVERNMENT SPENDING REVIEWS

Summary

About 7 ago Egoli Gas introduced a boiler conversation and gas supply project at Charlotte Maxeke hospital. The project was introduced because of the environmental issues experienced by people living around the hospital. This would reduce carbon emissions and protect exposed residents from all fall-out from the hospital chimney. The project was then extend to 31 health institution between 2016 and 2018.

Focus was mainly on the costs and benefits for the conversion. BAS historical expenditure for the installation and consumption of both coal and gas was estimated and some management accounts data was also used. An analysis of the programme discovered that contracts entered into were not favourable to Gauteng Department of Health (GDoH).

In order to assess the potential savings and trade-offs, the costs associated with each option were projected from 2019/2020 to 2021/2022 using the real compound annual growth rate (CAGR) and projected consumer price index (CPI) of 4.5%. Total estimated expenditure on gas amounted to R420.144 million between 2015/2016 and 2018/19 and total estimated expenditure on coal amounted to R353.878 million during the same period. Coal boilers were found to be cost effective when compared to gas boilers. However, gas has more benefits than coal.

Contents

1. Introduction	page 1
2. Policy and Institutional Information	page 2
3. Programme Chain of Delivery	page 3-4
4. Expenditure Observations	page 5-6
5. Performance	page 7
6. Options	page 8
7. Recommendations	page 9
8. Action	page 10
Annexure 1: Logframe	
Annexure 2: Expenditure tables	
Annexure 3: Other analysis and information	

1. Introduction

Gas as a source of energy has the potential to address supply needs in the electricity, household, industry, commercial and public sectors. When used for electricity generation, it is an ideal transition fuel as it has half the emission of coal-based power. If the conversion is cost effective, it will result in cleaner environment, more efficient and reliable source of steam. Coal is a highly carbon-intensive fossil fuel, over reliance on it for energy needs can have negative environmental impacts, including air pollution due to coal combustion.

The objective of this performance and expenditure review was to understand the costs incurred from 2015/16 to 2018/19 on the use of coal and gas for boilers in various hospitals. Boilers are mainly used to heat water in hospitals, they are high in energy. Regular boiler inspections are important for optimal function and energy efficiency. Key to this research was to have a clear understanding of the conversion process from coal to gas, costs (if new boilers were installed or the old ones were used), potential savings and the buy-in from hospitals.

The expenditure on BAS does not reflect the total amounts paid for the conversion, gas and coal consumption as well as maintenance cost. Management accounts were used to ensure total costs for the project. The gas consumption was significantly low because some hospitals continued to use coal-fired boilers for backup and other reasons. And those with diesel boilers relied on those instead of the gas boilers.

2. Policy and Institutional Information

The Gauteng Province has adopted a ten pillar programme based on the transformation, modernisation and re-industrialisation (TMR) programme. The current economic growth model of Gauteng is energy great and relies mainly on coal for electricity generation while it has been proven that the impact of renewable energy consumption to economic welfare and economic growth is positive and statistically significant.

Coal will remain part of the energy mix into the foreseeable future due to its great quantity. It will mainly contribute to generate power that will help the province become energy secure. Gauteng hospitals are committed to support the move towards a low carbon economy, ensuring that there is improvement in energy efficiency and the scaling up of renewable energy options as well as the supply of natural gas and alternative energy options.

The first step in the process was for the Gauteng Department of Health and hospitals to identify the forces that drive the decision to convert from coal to gas. The beneficiaries of this project is Gauteng community through the hospitals. The Accounting Officers for Gauteng Health and Gauteng Department of Infrastructure are involved in the design and implementation of this programme.

The green agenda is cross cutting, hence the coordination and collaboration amongst all key players is essential. Collaboration is essential for optimal results in reducing the country's carbon footprint, ensuring environmental sustainability, preservation of water resources and in curbing poverty. At national level the role players is the Department of Environmental Affairs and Tourism, Department of Energy and the Green Building Council of South Africa. At provincial level the role players is the Gauteng Department of Infrastructure Development (GDID) and GDoH. GDID is an implementing agent for GDoH for all infrastructure projects.

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3. Programme Chain of Delivery

The gas issue is founded in the adoption of the 10-Pillar programme based on the Transformation, Modernisation and Re-industrialisation (TMR) programme. GDID initiated an investigation on behalf of GDoH on alternatives of converting coal to gas boilers in hospitals and the two departments participated in the investigation.

The following alternatives were proposed:

- Crude oil-fired boilers
- Electrical fired boilers
- Conversion of existing boilers into coal dust infused boilers (to compensate for the poor-quality coal)
- Conversation to gas fired boilers
- Replacement with new fired boilers

In 2010 one service provider introduced a boiler (dual-fired boiler run on diesel or gas) conversion and gas-supply project at Charlotte Maxeke hospital (CMH). This was intended as a pilot and it was successful. The contract was negotiated by GDID and the hospital management and was a stand-alone project which ran until 2016. They found this necessary because of the environmental issues resulting from coal powder in the atmosphere.

After the successful implementation of the CMH gas project, GDoH engaged GDID to investigate and undertake a “Green Agenda Infrastructure Programme” on behalf of GDoH to convert other institutions to gas-fired boilers and it was decided to consider gas.

Contracting with suppliers was done through supply chain of GDID. Different contracts were negotiated with different suppliers. The budget for the replacement of the electro mechanical equipment and maintenance was confirmed by GDID.

Various service providers entered into contracts with GDID on behalf of GDoH, to supply the following types of gas to institutions:

- Piped Natural Gas – Natural gas (Methane) is piped to the facility using a pipeline
- Compressed Natural Gas – the gas (Methane) is taken from the pipeline and compressed to approximately 250bar. The compressed gas is then transported to site using trucks. On site the gas is then de-compressed before it can be used
- LPG – LPG is the most expensive form of gas. LPG is mostly a mixture of Butane and Propane and is distilled from crude oil.

Below is a description of various contracts which were agreed to between GDoH and suppliers:

- **Take or Pay** - this principle obliges GDoH as a buyer to pay the contract price for an agreed quantity of gas over a set time period whether or not such quantity is required and supplied or not.
- **Take and Pay** - This principle obliges GDoH to both take and pay the contract price for the product or quantities of product delivered by the service provider or pay a penalty for each set time period when the buying department does not do so.
- **Minimum Order Quantities** – GDoH undertakes to take Minimum Monthly Off take, i.e. an undertaking that the department pay the full purchase price per month on assumption that the Minimum Monthly Off take (contracted amount) was taken.

4. Expenditure Observations

Conversion was done in phases. Phase 1 included nineteen hospitals, two community health centres and one laundry centre. Phase 2 predicted nine hospitals and one laundry centre. The renegotiated contracts (as mentioned below) required additional funding that separated the supply of gas from the installation of infrastructure, although not all suppliers initially complied with this. The total cost for infrastructure installation in 2016/17, based on the documents available for phase 1 was R52.196 million. The total cost for gas consumption from 2016/17 to 2018/19 was R420.144 million. Coal consumption for the same period cost R353.878 million.

GAS AND COAL EXPENDITURE COMPARISON

ITEMS	2015/2016	2016/2017	2017/2018	2018/2019	Grand Total
Inventory gas	32 447 438	37 342 944	161 559 504	188 794 376	420 144 262
Wood and coal	117 303 077	103 317 282	79 187 599	54 070 172	353 878 130
Grand Total	**149 750 515**	**140 660 226**	**240 747 103**	**242 864 548**	**774 022 392**

GAS EXPENDITURE PER HOSPITAL

Hospital names	2015/2016	2016/2017	2017/2018	2018/2019	Grand Total
BHEKI MLANGENI HOSPITAL			771 257	478 047	1 249 304
BHEKI MLANGENI HOSPITAL-A	1 204 422	55 068			1 259 490
CAP & HEALTH TECH PORTFOLIO			69 551 022		69 551 022
CARLETONVILLE HOSPITAL			807 542	6 368 612	7 176 154
CARLETONVILLE HOSPITAL-A	2 672 511	2 409 214			5 081 725
CHRIS HANI BARA ADMIN-A	2 786 224	1 637 316			4 423 540
CHRIS HANI BARAGWANATH HOSPITAL			1 949	-	1 949
CULLINAN CARE & REHAB CENTRE			81 206	20 046	101 252
CULLINAN CARE & REHAB CENTRE-C	108 841	117 867			226 708
DISCOVERERS CHC-A	1 568 584	16 169 460	3 903 752	3 017 619	24 659 416
DR GEORGE MUKHARI HOSPITAL			534 774	30 294 020	30 828 794
DR GEORGE MUKHARI HOSPITAL-C	402 709	338 908			741 617
DR YUSUF DADOO HOSPITAL			12 193 611	6 329 509	18 523 121
DR YUSUF DADOO HOSPITAL-A	3 070 196	103 195			3 173 391
DUNSWART LAUNDRY			26 420		26 420
EDENVALE HOSPITAL			2 080	102 263	104 343
EDENVALE HOSPITAL-A	1 353 381	327 460			1 680 841
FAR EAST RAND HOSPITAL			4 690 310	7 494 205	12 184 515
FAR EAST RAND HOSPITAL-B	1 649 229	570 593			2 219 822
HEIDELBERG HOSPITAL			349 682	1 864 411	2 214 093

HEIDELBERG HOSPITAL-B	122 105	123 752			245 857
HELEN JOSEPH HOSPITAL			970 520	350 600	1 321 120
HELEN JOSEPH HOSPITAL-A	5 217 431	130 202			5 347 633
JOHAN HEYNS CHC-B	113 725	532 005	766 327	12 505 446	13 917 504
JUBILEE HOSPITAL			3 859 036	7 771 645	11 630 681
JUBILEE HOSPITAL-C	515 200	987 806			1 503 006
KALAFONG HOSPITAL			4 424 661	938 799	5 363 460
KALAFONG HOSPITAL-C	289 830	320 680			610 510
KOPANONG HOSPITAL			6 592 763	2 484 871	9 077 634
KOPANONG HOSPITAL-B	1 198 644	26 736			1 225 380
LERATONG HOSPITAL			3 031 366	10 828 832	13 860 198
LERATONG HOSPITAL-A	491 312	154 247			645 559
ODI HOSPITAL			3 486 242	15 213 868	18 700 109
ODI HOSPITAL-C	55 160	2 538 170			2 593 330
PHOLOSONG HOSPITAL			663 382	3 110 384	3 773 767
PHOLOSONG HOSPITAL-B	103 010	89 432			192 441
RAHIMA MOOSA HOSPITAL			8 095 846	9 346 534	17 442 380
RAHIMA MOOSA MOTHER&CHILD HOSP	4 043 063	4 122 796			8 165 859
SEBOKENG HOSPITAL			5 603 574	5 661 287	11 264 861
SEBOKENG HOSPITAL-B	172 037	1 516 611			1 688 648
SOUTH RAND HOSPITAL			6 551 584	6 272 438	12 824 022
SOUTHRAND HOSPITAL-A	1 639 657	1 032			1 640 688
STERKFONTEIN HOSPITAL			5 051 501	14 999 557	20 051 058
STERKFONTEIN HOSPITAL-A	846 235	1 736 336			2 582 571
STEVE BIKO HOSPITAL			1 952 111	104 295	2 056 406
STEVE BIKO HOSPITAL-C	142 402	465 449			607 850
TAMBO MEMORIAL HOSPITAL			10 982 818	38 140 338	49 123 155
TAMBO MEMORIAL HOSPITAL-B	483 686	223 097			706 782
TEMBISA HOSPITAL			3 154 731	2 299 145	5 453 877
TEMBISA HOSPITAL-B	508 442	113 712			622 154
THELLE MOGOERANE HOSPITAL			348 578	278 025	626 603
THELLE MOGOERANE HOSPITAL-B	-	527 506			527 506
WESKOPPIES HOSPITAL			3 110 857	2 519 580	5 630 436
WESKOPPIES HOSPITAL-C	1 689 404	2 004 293			3 693 697
Grand Total	**32 447 438**	**37 342 944**	**161 559 504**	**188 794 376**	**420 144 262**

Six months after entering into the contracts, it became apparent that the gas consumption level per institution was significantly lower than the contracted amount, resulting in the department purchasing gas that it was not using or being forced to pay for gas that facilities did not consume (fruitless expenditure). The contracts determined that whether facilities take or consume, based on low demand, the contracted monthly amounts were still payable to suppliers

GDoH identified the following reasons for low gas consumption:

- Over-estimation of gas consumption calculated by consultants;
- Hospitals that still had access to coal supply and coal-fired boilers continued to use this as it was cheaper and
- Hospitals with diesel boilers also switched to these boilers more often especially when diesel fuel was in adequately supply.

Take or Pay, Take and Pay and Minimum Order Quantities as per the original contract resulted in GDoH purchasing gas that it did not use. GDoH and GDID renegotiated with the gas suppliers to prevent wasteful expenditure, but the revised contracts were still unfavourable to GDoH. The amended contracts stipulated reduced gas volumes to be used by institutions and should they consume below the minimum, the monthly rental would automatically increase. The price per GJ were increased by 40%. Penalty costs became part of the Infrastructure Maintenance costs, resulting in the overheating of the budget.

Other challenge with these contracts was that the conversion of boilers from coal to gas required new infrastructure; however, the contracts were structured so that the infrastructure would be leased to GDoH for the duration but remain the property of the supplier. The inherent risk is should suppliers remove their infrastructure facilities would be left in an indeterminate state, with potentially terrible effects on the operation of the institutions. In 2017/18 GDoH also paid for a court settlement agreement with one of the suppliers for non-payment due financial constraints facing the department.

5. Performance

Comparison of this and the gas contracts summary table above suggests that the initial contractual commitment for gas far exceeds the provision in the budget, even if it was assumed that the department wholly switched to gas from coal and diesel. The immediate implications

of this are that the contracts are unaffordable, and with the current state of GDoH finances, a further drain on an already constrained baseline.

It is not clear why these contracts were entered into while knowing full well what the burden of accruals facing the department is. As it were, three months into the 2018/19 financial year, 63 per cent of the allocation for gas has already been spent.

One other challenge with these contracts was that the conversion of boilers from coal to gas required the laying-out of infrastructure. However, the contracts were structured in such a manner that the infrastructure would be leased to GDoH for the duration of the contract, but ultimately remained the property of the supplier. This arrangement poses an inherent risk should suppliers remove their infrastructure, as facilities would be left in halfway with potentially dire effects on the operation of these hospitals.

6. Options

The gas contract costs suggest that the initial contractual commitment for gas exceeds the provision in the budget, even if it was assumed that the department entirely switched to gas from coal and diesel. The immediate implication of this is that the contracts are unaffordable, and with the current state of GDoH finances, a further drain on a constrained baseline. It is not clear why these contracts were entered into while knowing the burden of accruals that is facing the department.

The entire exercise has proven that the conversion is unaffordable and undesirable by most of institutions since the usage and rental of installed infrastructure is funded from goods and services budget of each facility. A consideration should be given to the use of budget allocated to infrastructure to ease pressure on goods and services allocation. Cancellation of contracts will have financial and other logistical implications, however these must be measured against

fruitless and wasteful expenditure which will occur every financial year for the period of the contracts.

The department should not enter into contracts which are not clear. Detailed research must be conducted prior to signing of contracts and the contract term should be six months or less to avoid cancellation fees.

7. Recommendations

- HoD for GDoH and GDID must engage with the CEOs of all hospitals regarding the Gas Supply Programme and do a presentation on change management. Only GDoH head office and DID participated in the investigation of the project.
- A workshop between GDoH and GDID to firm up the position on the Gas Project going forward.
- Encourage health institutions to increase the current gas consumption since is good for the environment by intervention of the relevant engineers from GDoH and GDID. Hospitals that still had access to coal supply and coal-fired boilers continued to use this as it was cheaper and those with diesel boilers also relied on these boilers, especially when diesel fuel was plentiful.
- The costs of installation and consumption should be recorded separately and allocated to the correct institutions.
- Hospital management need to be convinced and encouraged to pay for gas consumption since is cheaper and which is usually greatly reduced due to the comparative high cost when compared to coal.
- The delegation authority for CEOs at the hospitals should be increased from R500 000 to at least R1.5 million. The hospital management at most hospitals cannot make gas payment because the delegation limitations will result to unauthorised or irregular expenditure.

8. Action

Consultation with GPT Infrastructure Unit and DDG for Sustainable Fiscal Resource Management will be done with immediate effect.

- The first thing to do will be to engage a specialist responsible for GDoH to make recommendation that budget for boiler installation and maintenance be allocated within the departmental infrastructure or capital budget. This will assist institution to afford gas consumption from their goods and services budget.
- Outcomes of the meeting will then be discussed with the DDG for recommendation to the Premier Budget Committee.

Site visit to few institutions will happen within 30 days.

- Set-up a meeting with hospital management to have a better understanding reasons for still relying on coal and diesel boilers.
- Ask if proper consultation was done prior to the conversion.
- Will find out if proposed training will improve the current understand of the entire process.
- Understand all other things hindering the success of the gas to coal project.

Within a period of three month, a follow up with both GDoH and GDID on the way forward with regards to the project will take place, if they are cancelling the contracts or finding alternative ways to solve this crisis. Perform further research on how all expenditure is recorded on BAS to get to the correct total spending per institution and items.

