



MONITORING RENEWABLE ENERGY PERFORMANCE OF POWER PLANTS

PROGRESS IN THE FIRST HALF OF 2019



ISSUE 14
September 2019

PREPARED BY: Dr A. Gxasheka

Mr H. Mokhonoana

Mr M. Kgopa

Mr M. Moroeng

Ms R. Mokoena

Ms N. Ndlovu

Contact Email: REIPreports@nersa.org.za

Tel: 012 401 4600





Contents

Glossary of Terms.....	3
ABBREVIATIONS.....	4
Part A: Technical Performance of Renewable Energy Power Plants	
1. Status of Renewable Energy IPP Procurement Programme	5
2. Energy Production of Renewable Energy Independent Power Producer Programme.....	6
3. Estimated Cost of Energy of IPPs in 2017.....	7
4. Renewable Energy Power Plants Outside the IPP Procurement Programme.....	8
Part B: Renewable Energy Production Contribution to Socio-Economic Development.....	10
5. Economic Development Obligations for IPPs.....	10
6. Data Sources of IPPs SED.....	12
7. Employment by RE Power Plants.....	13
8. Socio-Economic Development and Enterprise Development.....	15
8.1 Socio-Economic Development Performance.....	15
8.2 Enterprise Development Performance.....	15
8.3 Ownership Performance.....	16
8.4 Preferential Procurement Performance.....	16
9. Conclusion Remarks.....	17
APPENDIX A: Geographical Location of IPP Projects in South Africa....	18
APPENDIX B: Some Socio-Economic Development Activities of PPs around South Africa.....	19



Glossary of Terms

BID WINDOW

Means any of the procurement phases under the Renewable Energy Independent Power Producer Procurement Programme of the Department of Energy.

ENERGY REGULATOR

Means the regulatory authority established as a juristic person in terms of Section 3 of the National Energy Regulator Act, 2004 (Act No. 40 of 2004).

Government

Means the Government of the Republic of South Africa, and any of its departments, agencies or other entities that it manages or controls.

GIGAWATT HOUR

Energy unit in which electricity consumption is measured. 1GWh = 1000MWh.

INDEPENDENT POWER PRODUCER (IPP)

IPPs are defined as typically limited-liability, investor-owned enterprises that generate electricity either for bulk sale to an electric utility or for retail sale to industrial or other customers with certain conditions.

MEGAWATT HOUR

Energy unit in which electricity consumption is measured. 1MWh = 1000kWh.

MINISTER

Means Minister of Energy

RENEWABLE ENERGY (from the 2003 White Paper on Renewable Energy)

Renewable energy harnesses naturally occurring non-depletable sources of energy, such as solar, wind, biomass, hydro, tidal, wave, ocean current and geothermal, to produce electricity, gaseous and liquid fuels, heat or a combination of these energy types.



ABBREVIATIONS

BBBEE	Broad Based Black Economic Empowerment
BW	Bid Window
COD	Commercial Operation Date
CSP	Concentrated Solar Power
DMRE	Department of Mineral Resources and Energy
ED	Economic Development
EME	Exempted Micro Enterprises
GWh	Gigawatt hour
IPP	Independent Power Producer
IRP	Integrated Resource Plan
MW	Megawatt
MWh	Megawatt hour
NERSA	National Energy Regulator of South Africa
PV	Photovoltaic
QSE	Qualifying Small Enterprises
RE	Renewable Energy
REI4P	Renewable Energy Independent Power Producer Procurement Programme
SED	Socio-Economic Development
TWh	Terawatt Hour



PART A: TECHNICAL PERFORMANCE OF RENEWABLE ENERGY POWER PLANTS

1. Status of Depart of Energy Renewable Energy IPP Procurement Programme

In terms of section 4 of the Electricity Regulation Act 2006 (Act No. 40 of 2006) ('the Act'), NERSA has a mandate to 'establish and manage monitoring and information systems and co-ordinate the integration thereof with other relevant information systems'. The Renewable Energy (RE) Independent Power Producers (IPPs) are required to submit reports on their monthly energy production, pursuant to section 15 of Grid Connection Code for Renewable energy version 3.0 of 2019.

As of 30 June 2019, 65 REI4P projects under of the Department of Mineral Resources and Energy (DMRE) are in commercial operation. This total number of projects did not change compared to the number reported for the period ending 31 December 2018, that is, there were no new REI4P power plants commissioned after the end of December 2018. The total commercial-capacity of these REI4P projects was approximately 3 981MW. These projects are from BW1 (28 projects), BW2 (19 projects), BW3 (16 projects) and BW3.5 (2). Figure 1 below shows the cumulative annual commercial capacity of these projects since 2013.

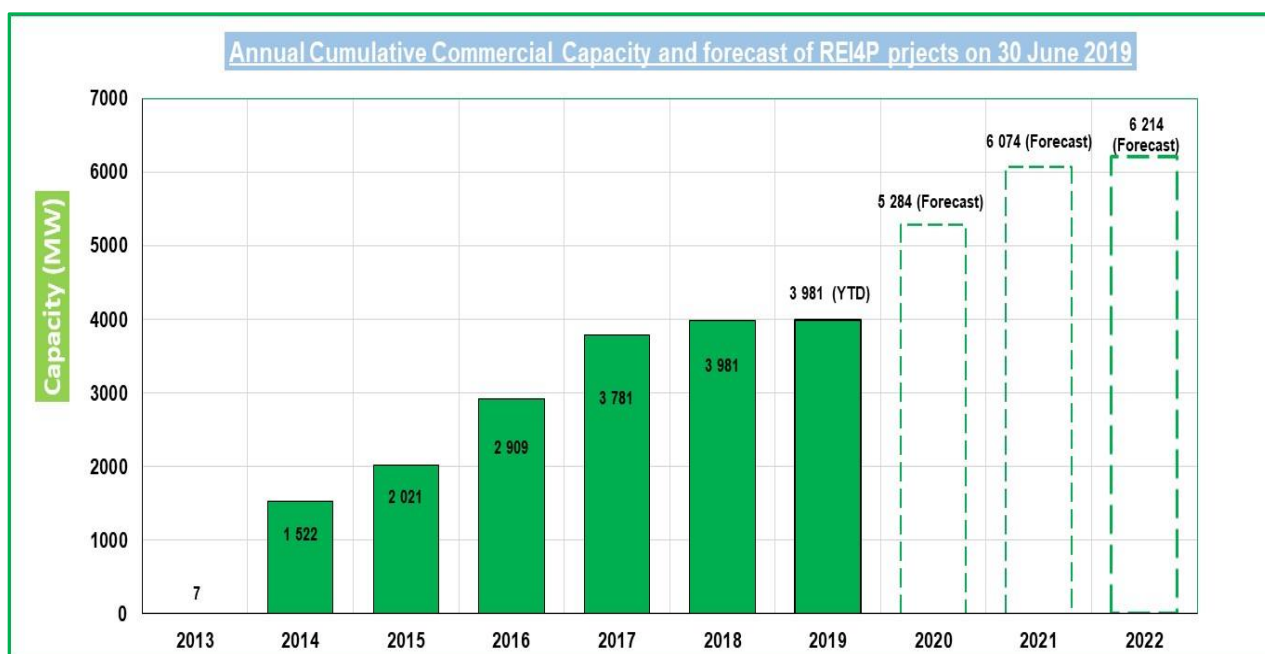


Figure 1: Cumulative capacity of DoE IPP projects on 30 June 2019. [Data sourced from IPPs].

REI4P projects from BW4 are expected to start operating towards the end of 2019. Based on the scheduled CODs, it is expected that nearly 72MW will be added before the end of 2019.



Figure 2 shows procured versus commercial capacities for REI4P projects. From the plot it can be seen that most of IPP projects of various RE technology procured have reached commercial operation.

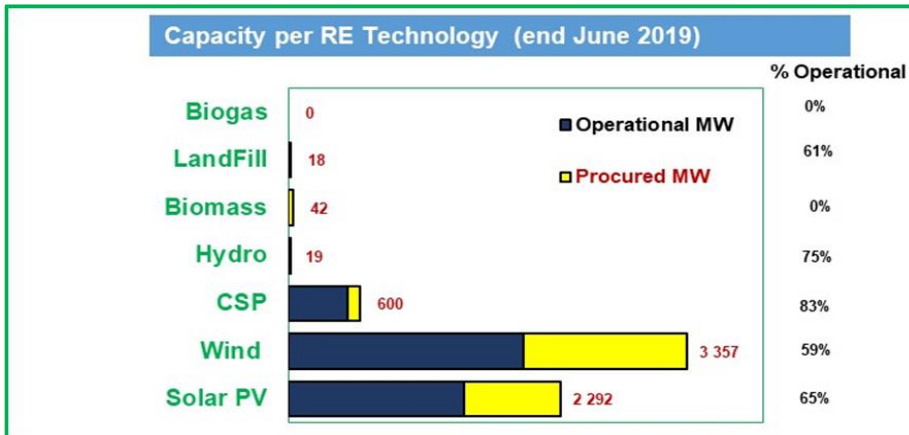


Figure 2: Achieved RE technology capacity in commercial operation as of 30 June 2019. [Source IPPs, 2019]

2. Energy Production of Renewable Energy Independent Power Producer Programme Projects

In this section, the energy production of DoE IPP power plants in commercial operation is analysed, focusing on the monthly contribution of the power plants. Figure 3 shows the monthly energy production in the first half of 2019. The monthly energy could exceed 700GWh per month in first three months of 2019. The power system experienced days of load shedding, hence there is noticeable drop in monthly energy.

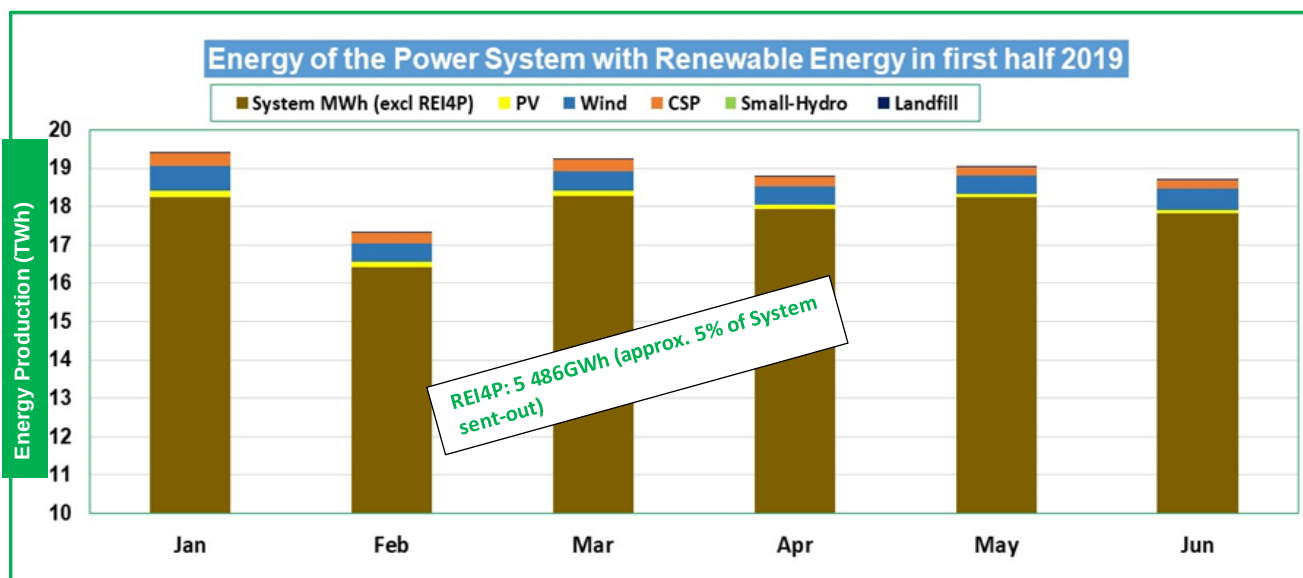


Figure 3: Monthly Energy Production of REI4P projects in the first half of 2019. [Data sourced from IPPs].

3. Estimated costs of energy of IPPs in 2019

In this section, the energy and its cost of REI4P projects for different RE technologies is presented for the period between 1 January 2019 to 30 June 2019. Payments related to deemed energy payments are included in the cost, while other costs such as network charges are not included in the analysis.

Figure 4 shows the energy production of 65 operational projects per technology from 1 January 2019 to 30 June 2019. These projects are from BW1, BW2, BW3 to BW3.5. Also shown in the plot are the average the costs of REI4P projects in that period.

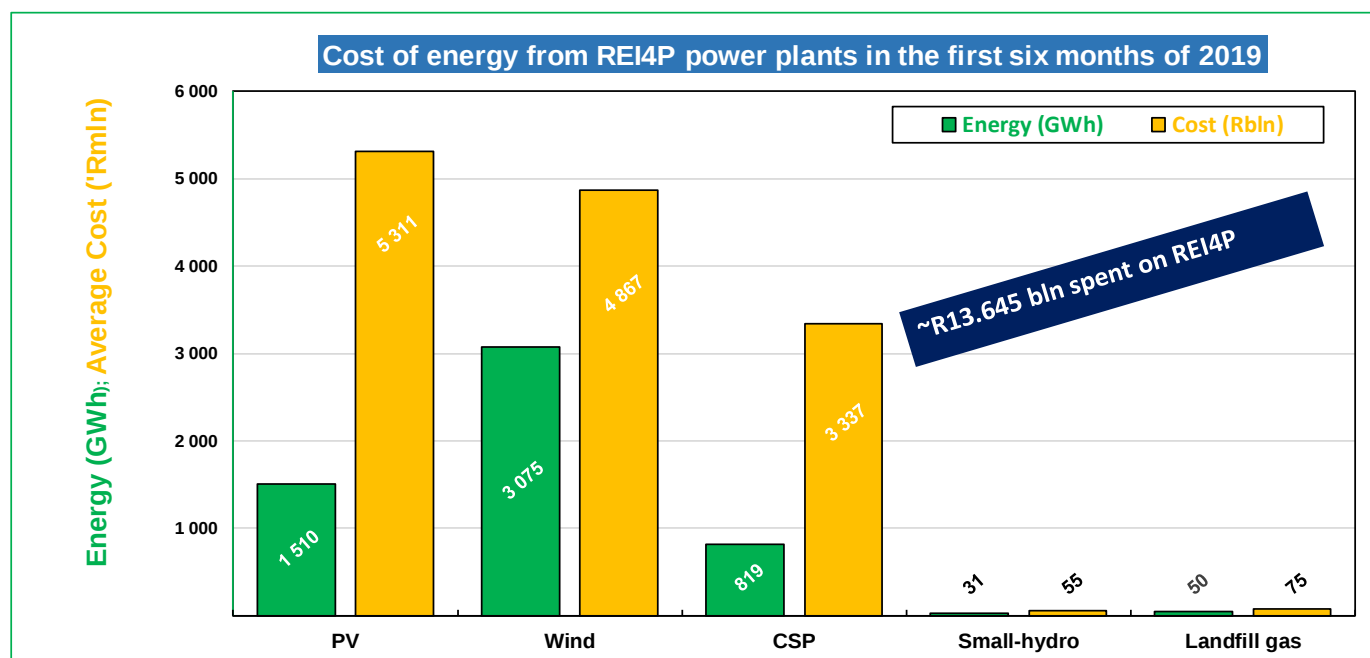


Figure 4: Energy and cost of the REI4P projects in the first six months of 2017. [Data sourced from IPPs]

It is evident from the plot that PV technology had the highest cost (R5.3billion), followed by Wind technology (R4.8billion). The energy cost of CSP and small-hydro was about R3.3billion and R55million, respectively. The costs of landfill gas technology in the same period of reporting was about R75million.

The total costs of all energy produced by REI4P projects IPPs in the first half of 2019 was approximately R13.65billion. This cost has increased by 26% compared to the first half of 2018. This increase in cost is attributed to increase in energy production as a result of new power plants added to the grid in the second half of 2018 and inflation. Based on the energy production and costs in this six month of 2019, the average price of PV was R3.516/kWh, including value added tax. This price is expected to drop when BW4 PV projects start operating. PV prices in BW4 are less than R1.10/kWh. During the same period in 2018, the cost of REI4P projects was R10.2billion for total energy production of R5.1TWh.

During the same period in 2018, the energy-weighted cost of PV was cheaper at R2.71/kWh compared to this year, mainly due to the lower cost of R4.2billion versus R5.3billion paid in 2019. Wind energy average price increased from R1.42/kWh in 2018 to R1.58/kWh in 2019, mainly due to inflation. CSP energy-weighted prices increased from R3.00/kWh in 2018 to R4.07/kWh in 2019 due to increase in use of thermal storage during peak hours. Increases in other RE technologies were driven mainly by inflation.



The average price of small-hydro was approximately R1.81/kWh compared to R1.54/kWh in 2018, while the price of the landfill gas was increased from R1.25/kWh to R1.49/kWh. The increases in average prices for small-hydro and landfill gas operating projects were mainly due to fluctuations in energy production.

4. Renewable Energy Power Plants Outside the IPP Procurement Programme

In addition to the REI4P, there are other RE power plants ('non-DoE power companies') connected to the grid. Non-DoE power companies are selling power through other incentive schemes, such as willing-buyer-willing-seller arrangements, as well as through green energy traders. Some municipalities own RE power plants connected to the grid. Table 5 lists RE power companies not under the REI4P. Their total capacity on the grid is 823.75 MW.

Table 1: Renewable Energy Power plant outside DoE IPP programme.

#	Renewable Energy Power Plant	Capacity(MW)	Technology	Location
<u>Independent Power Producers</u>				
1	Merino*	4	Hydro	Bethlehem, Free State
2	Sol Plaatjie*	3	Hydro	Bethlehem, Free State
3	Darlipp (Pty) Ltd *	5.2	Wind	Windhoek Farm, Darling, Western Cape
4	Electrawinds *	1.8	Wind	Nelson Mandela Bay Municipality
5	Mpact Piet Retief*	16	Baggase	Piet Retief , Mpumalanga
6	Friedenheim Hydro Electric Power Station *	2.5	Hydro	Nelspruit, Mpumalanga
7	Bronkhorstspuit Biogas Plant *	4.2	Biogas	Bronkhorstspuit, Gauteng
8	AC Witcher*	5.67	Biomass	Eastern Cape
9	Illovo *	6.5	Bagase	KZN
10	CPV Powerplant No. 2 (Pty) Ltd	0.477	Solar CPV	KZN
11	L'omarins *	2.4	Hydro	Western Cape
<u>Municipality Power Plants</u>				
12	Lydenburg *	2	Hydro	Lydenburg Dorpsgrond
13	Piet Retief Hydro*	0.6	Hydro	Mkhondo Municipality
14	Clanwilliam Hydro Power Station*	1.5	Hydro	ClanWilliam, Western Cape
<u>ESKOM Power Plants</u>				
15	Gariep Hydro	360	Hydro	Norvalspoor/Between Free State & Northern Cape
16	Vanderkloof Hydro	240	Hydro	Petrusville/Between Free State & Northern Cape
17	Transkei hydro Colleywobbles	42	Hydro	Mbashe River/ Eastern Cape
18	Transkei Hydro First Falls *	6	Hydro	Umtata River/ Eastern Cape
19	Transkei Hydro Second Falls	11	Hydro	Umtata River/ Eastern Cape
20	Ncora Hydro *	2.1	Hydro	Umtata River/ Eastern Cape
21	Sere Wind Farm *	105.8	Wind	Western Cape
	Total Capacity (MW)	823.75		

Note: * Power plants that submitted data to NERSA in the first half of 2019.



Figure 5 shows the reported energy production of 17 renewable energy power plants listed in Table 5. These reporting power are marked with an asterisk (*) in the table. In the first half of 2019, the total energy reported by these power plants was 232GWh. During the same period in 2018, non-REI4P projects reported energy output 101GWh of energy.

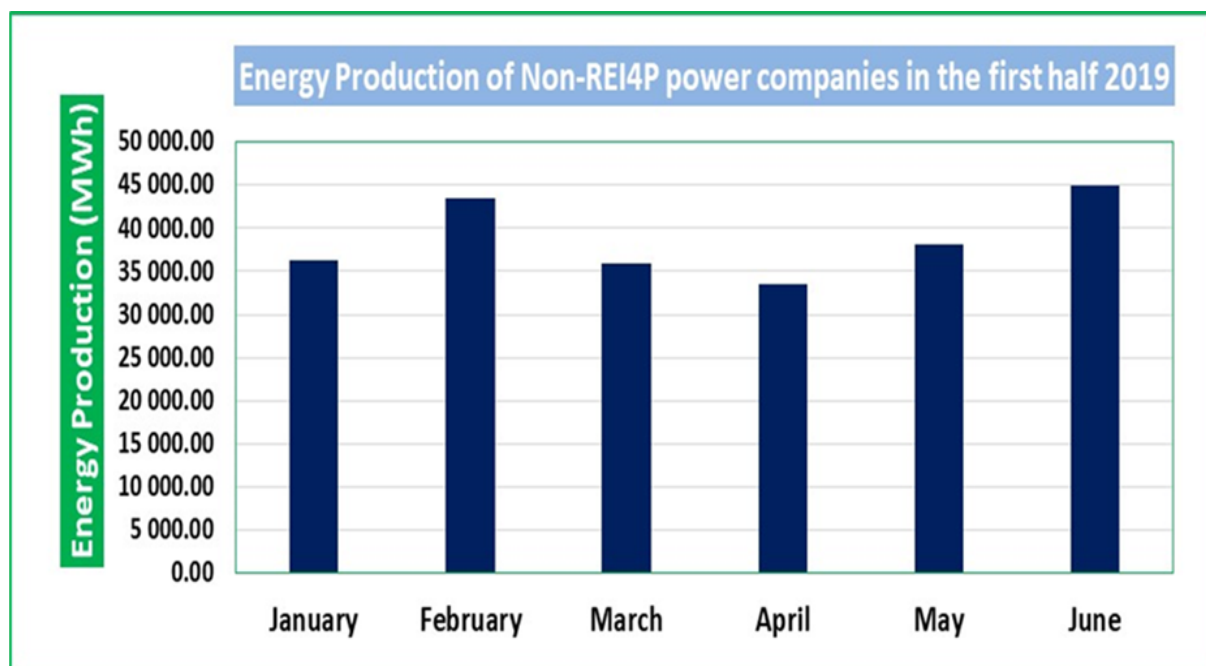


Figure 5: Energy production of renewable energy power plants not in the REI4P.



PART B: RENEWABLE ENERGY CONTRIBUTION TO SOCIO-ECONOMIC DEVELOPMENT

5. Economic Development Obligations for IPPs

To ensure that the introduction of RE benefits the citizens of the country, DMRE, National Treasury (NT) and Department of Trade and Industry (DTI), through Inter-Ministerial Committee, identified key Socio-Economic Development (SED) elements in which RE will be used to improve living standards of the communities in the areas where IPPs are located. These SED elements are in line with the key policies of the country, such as NDP and Green Economy Accord 2011.

As a way of achieving socio-economic development goals, Government developed the *IPP Procurement Programme Economic Development Policy* dated 15 March 2011, which is aimed at fulfilling the following outcomes:

- ❖ job creation
- ❖ use of local content through inter alia increased local manufacturing;
- ❖ fostering rural development and involving communities;
- ❖ education and the development of skills;
- ❖ enterprise development through the promotion of small businesses and packages for new entrants; and
- ❖ socio-economic development and participation by historically disadvantaged citizens and marginalized regions in the mainstream of the industrial economy.

Table 6 shows the average commitments of IPPs during various bidding stages of IPP procurement. The local content of procurement was increased from 25% to 40%, 45 to 65%, in BW1, BW3,3.5 and BW4, respectively.

In order to ensure that IPPs meet their minimum (min) quarterly obligations, the implementation agreements signed between IPPs and DMRE include penalties in a form of cumulative termination points when obligations of SED/ED are not fulfilled by IPPs.

Table 2: REI4P Economic Development Obligations per BW.

	BW1		BW2		BW3;3.5;4	
JOB CREATION <i>(job-years/ persons-month)</i>	Min	Target	Min	Target	Min	Target
SA citizen	50%	80%	50%	50%	50%	80%
SA citizen who are black	30%	50%	30%	30%	30%	50%
Skilled black SA citizen	18%	30%	18%	18%	18%	30%
SA citizens from local community	12%	20%	12%	12%	12%	20%
LOCAL CONTENT <i>(as a % of Project value)</i>	Min	Target	Min	Target	Min	Target
Wind;CSP with storage;Small Hydro	25%	45%	25%	60%	40%	65%
Solar PV and CSP	35%	50%	-	-	-	-
OWNERSHIP	Min	Target	Min	Target	Min	Target
Shareholding by black people and/or black enterprises in the seller	12%	30%	12%	30%	12%	30%
Shareholding by local communities in the seller	2,50%	5%	2,50%	5%	2,50%	5%
Shareholding by black people and/or black enterprises in the construction contractor	8%	20%	8%	20%	8%	20%
Shareholding by black people and/or black enterprises in the operations contractor	8%	20%	8%	20%	8%	20%
SOCIO-ECONOMIC DEVELOPMENT <i>(As a % of revenue)</i>	Min	Target	Min	Target	Min	Target
Socio-economic contributions	1,0%	1,5%	1,0%	1,5%	1,0%	1,5%
Adjusted socio-economic development contribution	1,0%	1,5%	1,0%	1,5%	1,0%	1,5%
ENTERPRISE DEVELOPMENT	Min	Target	Min	Target	Min	Target
Enterprise development contributions	1,0%	1,5%	1,0%	1,5%	1,0%	1,5%
Adjusted socio-economic development contributions	1,5%	1,5%	1,0%	1,5%	1,0%	1,5%
PREFERENTIAL PROCUREMENT	Min	Target	Min	Target	Min	Target
BBBEEE Procurement spend	60%	-	60%	-	60%	-
SME and QME(QSE and EME) Procurement	10%	-	10%	-	10%	-
Women owned vendor procurement	5%	-	5%	-	5%	-
MANAGEMENT CONTROL	Min	Target	Min	Target	Min	Target
Black top management	40%	-	40%	-	40%	-



6. Data source of IPP SED

In this report, information of SED of REI4P projects was sourced from DMRE and IPPs. The data obtained was for the quarter ending 31 March 2019. DMRE provided NERSA wind information individual project SED and ED targets for IPPs during bidding stages, and IPPs submitted the data for the quarter ending 31 March 2019.

Table 3 shows the list of the IPPs that submitted ED information for the period of commercial operation until the quarter ending 31 March 2019.

Table 3: REI4P power plants that submitted ED information for period ending March 2019

#	IPP ID	Power Plant	Technology	Bid Window	Capacity (MW)
1	IPPID 163	Aries Solar	PV	BW1	9.65
2	IPPID 123	Dassieklip Wind farm	Wind	BW1	27
3	IPPID 043	Dorper Wind farm	Wind	BW1	97.53
4	IPPID 443	Greefspan	PV	BW1	9.9
5	IPPID 696	Herbert	PV	BW1	19.9
6	IPPID 798	Khi Solar One CSP	CSP	BW1	50
7	IPPID 128	Konkoosies Solar	PV	BW1	9.65
8	IPPID 031	Letsatsi	PV	BW1	64
9	IPPID 032	Lesedi	PV	BW1	64
10	IPPID 138	Metro Wind	WInd	BW1	27
11	IPPID 564	Solar Capital De Aar	PV	BW1	75
12	IPPID 052	Soutpan	PV	BW1	27.94
13	IPPID 035	Witkop Solar	PV	BW1	29.68
14	IPPID 4057	West Coast Aurora Wind	Wind	BW2	90.8
15	IPPID 240	Amakhala Wind Farm	Wind	BW2	131.05
16	IPPID 373	Aurora Reivlei	PV	BW2	8.9
17	IPPID 750	Boshoff	PV	BW2	57
18	IPPID 168	Solar Capital De Aar	PV	BW2	75
19	IPPID 303	Tsitsikama Wind Farm	Wind	BW2	93.68
20	IPPID 375	Vredendal Solar	PV	BW2	8.82
21	IPPID 362	Waainek Wind Farm	Wind	BW2	23.28
23	RE_CS_0056_001	Xina CSP	CSP	BW3	100
23	RE_CS_0066_001	Khathu Solar Park	CSP	BW3.5	100
				TOTAL MW	1199.78

As can be seen in Table 3, 23 IPPs with a total capacity of nearly 1 199.78MW submitted requested SED/ED information of their projects. The analysis of ED/ED information is thus limited to these 23 IPPs.

7. Employment by RE Power Plants

In order to make sense of job creation figures, it is important to first explain the units of measurements. For the REI4P of DMRE, jobs are reported quarterly by IPPs using units of person-months, which are then converted to job-years. The metric of person-months is relevant for these types of projects because it allows for reporting of short-term jobs or tasks within a year (i.e. maintenance). When full-time equivalent employment figures are required, person-months are converted to units of job-years, which is defined as, one job for one person, for period of one year. In this context, it therefore follows that, the number of jobs, expressed in job-years, can be adjusted using the term or period of the jobs i.e. if a company creates 100 job-years that last for two consecutive years, then this is equivalent to 200 job-years created.

Job creation for RE power generation is characterised by a high number of jobs during the construction phase of the project as there is a high intensity of work to be completed in order to get the project running within a short period of time. Once the project is in operation, jobs that remain are fewer and are in technical maintenance and administration which is responsible for managing the business aspects of the power plant. This report is focusing on sustainable jobs created during operation period of 23 REI4P projects.

Figure 6 shows the obligation versus achieved employment opportunities for citizens of the Republic of South African (RSA) in the quarter ending 31 March 2019. During the quarter ending 31 March 2019, the 23 REI4P projects reported a combined total of 737 operational jobs for the citizens.

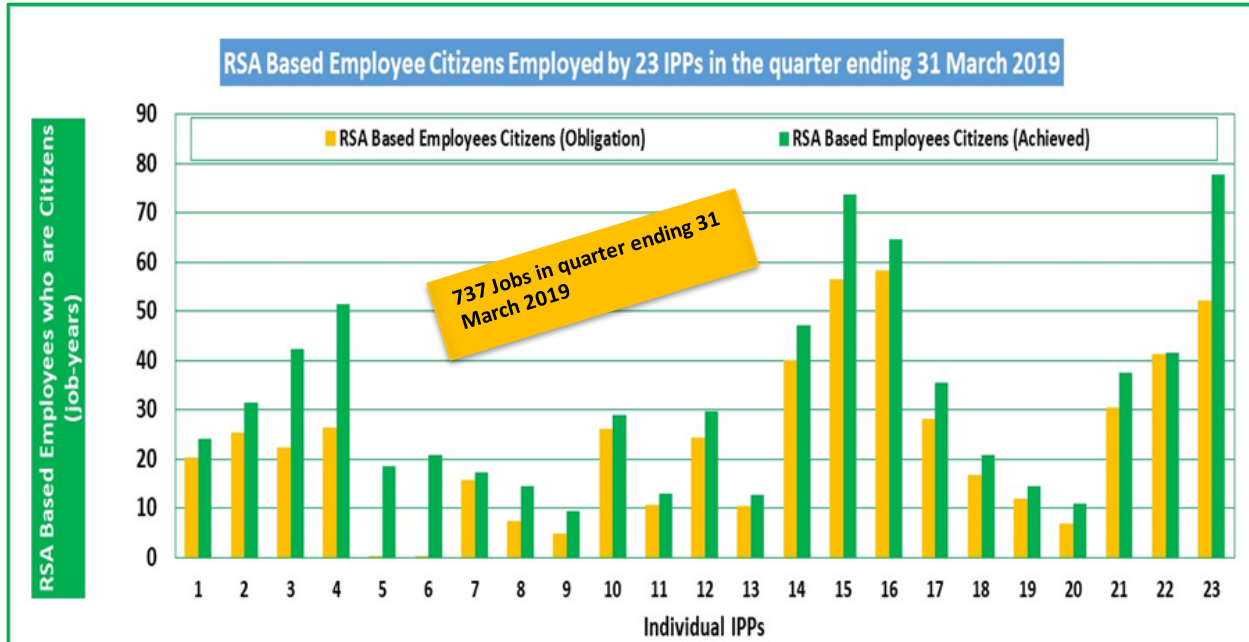


Figure 6: South African citizen employment by the 23 REI4P projects [Source: IPPs, June 2019]. One job-year is defined as an employment opportunity of one-person for one year (or 12 Months).



This achievement exceeds their minimum quarterly obligation of 533 job-years by 38%. It can also be seen from the plot that these 23 IPPs succeeded in meeting their obligations of various employment equity share.

Figure 7 shows the employment data for black RSA based employees for the operational quarter ending 31 March 2019. In that quarter, of the 737 jobs created for RSA based citizens, 651 jobs were for citizens who are Black. It can be seen that all these 23 operating projects exceeded their minimum obligations for employment equity share for RSA based employees who are blacks. The combined minimum threshold for the latter employment equity share element was 339 jobs.

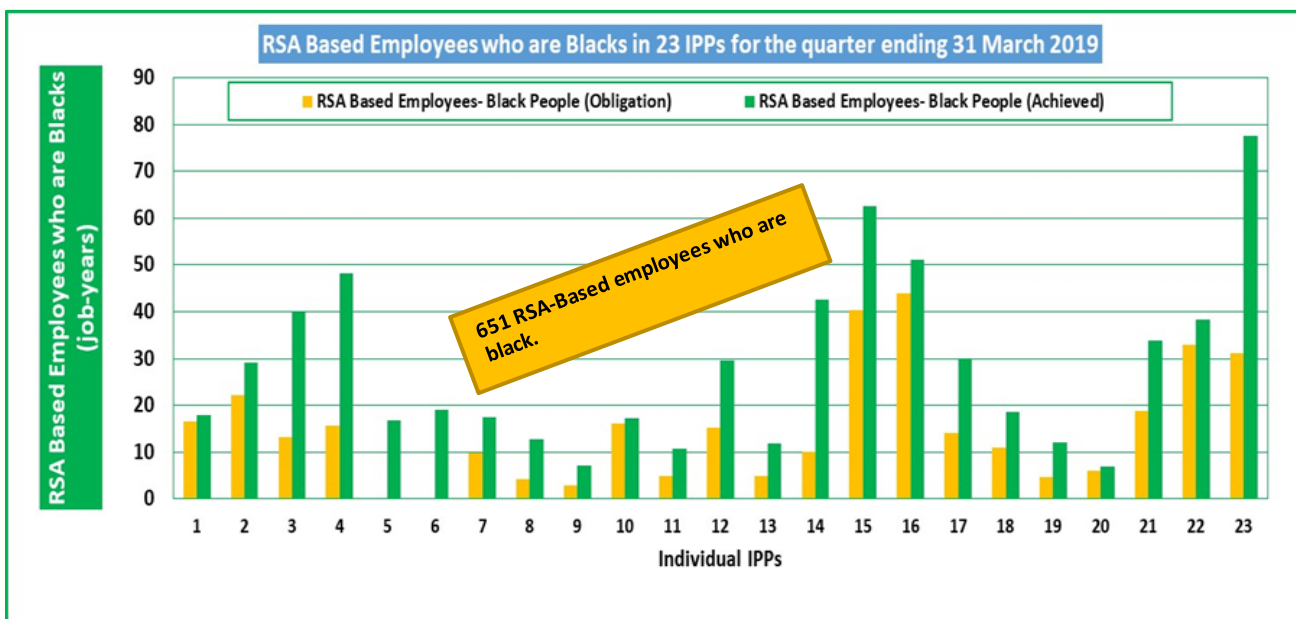


Figure 7: South African based employees who are black in the 23 RE4IP projects [Source: IPPs, June 2019]



8. Socio-Economic Development and Enterprise Development

8.1 Socio-Economic Development Performance

Under SED obligations, the general minimum threshold contribution of IPPs is 1% of their revenue, and the target over the 20-year period of PPA is 1.5% of the revenue. Figure 8 below shows the amount spent on various activities such as healthcare, education and skills development. For the quarter ending 31 March 2019, 23 IPPs spent 1.6% (R33.18m) of their total revenue on SED. This spending is significantly higher than their average SED obligation of 1% of total revenue.

Based on the data received from the 23 IPPs, education sub-element of SED received the most contribution (about R19.2m), followed by social welfare sub-element with R6.02m.

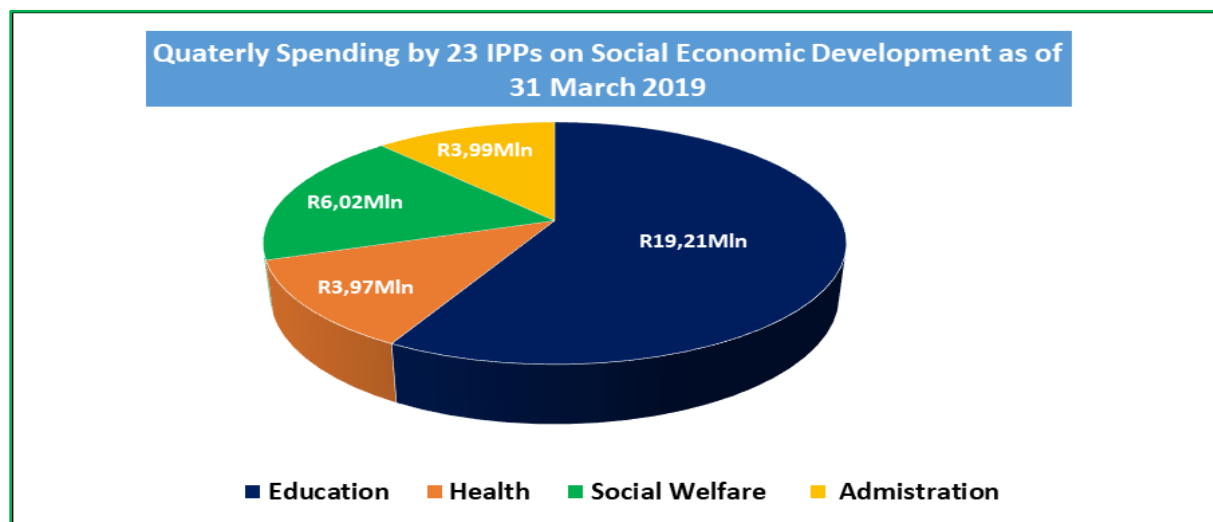


Figure 8: Socio-Economic Development Spread for 23 IPPs [Source: IPPs, 2019].

The challenge that has been identified by DMRE for this element is that the contributions of IPPs are concentrated in the vicinity of communities where IPPs operate, which means that there is a lack of spread across geographical areas, which in turn implies that there are communities that do not benefit because there are no IPPs in their area.

8.2 Enterprise Development Performance

The Enterprise Development (ED) of IPPs has the average minimum threshold spending of 0.7% of the revenues over the 20-year period of operation. The total amount of revenue of 23 IPPs in the quarter ending 31 March 2019 was about R 2.12billion. The 23 IPPs contributed R9.82million towards ED element. The latter ED spending is equivalent to 0.5% of the combined revenue, and it is therefore less than the threshold of 0.7% of revenue in the quarter under examination. This shortfall can be attributed to newer operating power plants which have not started ED activities.



8.3 Ownership Performance

Shareholding is used as a measure for ownership shown in Figure 9. From the chart it can be seen that the 23 IPPs were able to meet their obligations (inner circle target), relative to the total ownership sub-elements as reflected below:

- black people in the seller – 32% achieved against a target of 29%;
- black people in the operation company – 18% achieved against a target of 13%; and
- local communities in the seller – 8% achieved against a target of 8%.

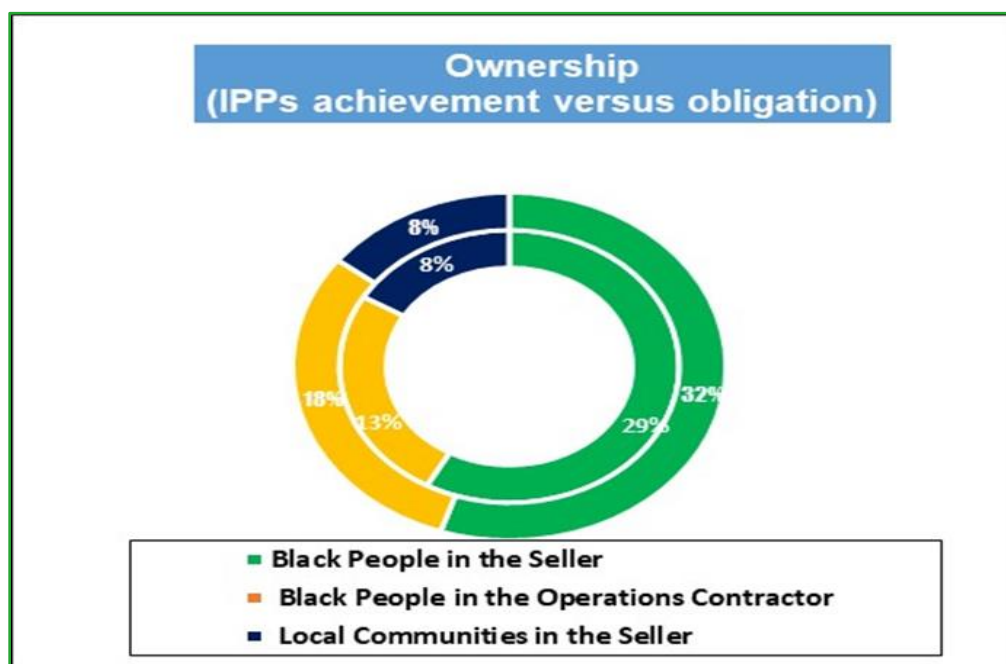


Figure 9: Achieved Ownership for IPP companies [IPPs, 2019]

8.4 Preferential Procurement Performance

Figure 10 below shows the spending on preferential procurement for the quarter ending 31 March 2019. The 23 REI4P projects spent a combined total of ~R112million towards BBBEE, and this spending exceeded their combined minimum obligation of R87.7million for BBBEE in that quarter. These high levels of achievement towards BBBEE by these projects indicate that there is high commitment of empowering previously disadvantaged black people – a target that government is aiming to achieve with these RE projects.

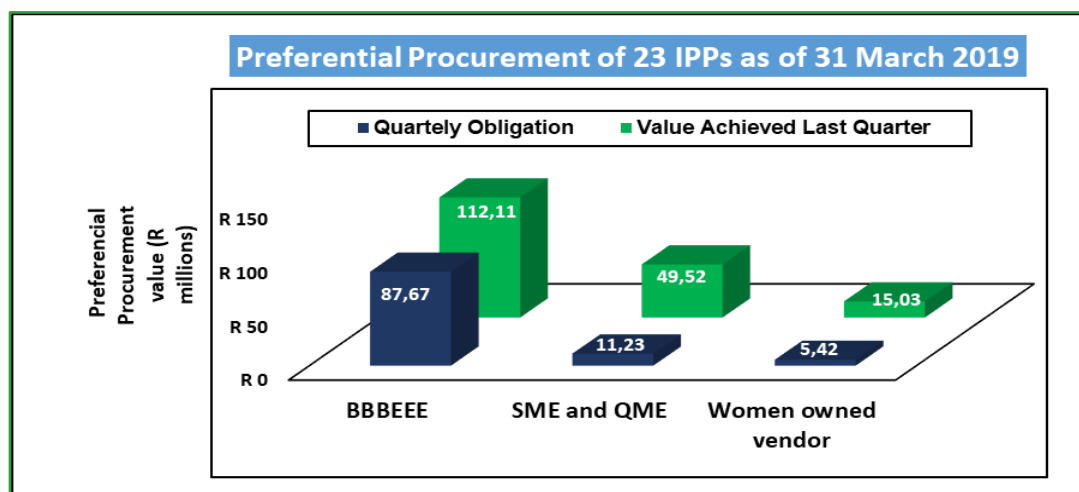


Figure 10: Preferential procurement of 23 IPPs in the quarter ending 31 March 2019.

From Figure 10, it is also evident that the spending on Small Medium Enterprises (SMEs) and Qualifying Medium Enterprises (QMEs) achieved R49.5million. The latter amount is higher than their combined minimum target of R11.2million. A total amount of R15million was spent towards women-owned vendors by these IPPs, and this surpassed the minimum obligation of R5.4m for the quarter ending 31 March 2019.

9. Concluding Remarks

As of 30 June 2019, the total of number of REI4P and non-DMRE RE power projects in commercial operation was 86. The latter number includes 65 IPP projects and 21 non-DMRE power companies. Their total achieved capacity on the grid was nearly 4 604MW. Based on energy production data submitted by REI4P and non-DMRE power companies in the first half of 2019, the total energy produced was approximately 5 486GWh. The cost of this energy produced by REI4P projects in the first half of 2018 was approximately R13.65billion. RE power projects outside DMRE procurement programme contributed 232GWh.

Based on the information submitted by 23 IPPs, for the operation period of their power plants, 737 operational citizen jobs were created during the quarter ending 31 March 2019. The latter number of operational jobs created exceeded the minimum target of 533 jobs. The minimum ownership thresholds for local community, black people in the seller and operating contractor were also achieved. The 23 REI4P projects spent a combined total of ~R112m towards BBBEE, and this spending exceeded their combined minimum obligation of R87.7m for BBBEE in that quarter.

APPENDIX A: Geographical location of DoE IPP Projects in South Africa

Figure A1: Renewable Projects of BW1 to BW 4. Numbers in the location markers indicate different BWs

