



Black Energy  
Professionals  
Association



## Draft Integrated Resource Plan

Portfolio Committee on Energy

# Introduction



The Black Energy Professional Association (BEPA) is an organization of black professionals that practice their trade within the energy sector

01



We develop skilled black professionals that can meaningfully participate in the sector

05



BEPA work towards ensuring the South Africa's energy industry is geared towards supporting sustainable inclusive economic growth and benefits the people of South Africa

02



BEPA encourages further participation of black professionals in the South African energy industry as a whole

06



We aim to address the exchange of information and ideas; aspirations of black industry participants and encourage public participation in the energy sector

03



We provide direct feedback to decision makers on policies and legislative measure in the energy sector

07



BEPA represents a unified voice that represents black interests and provides perspectives on transformation and empowerment

04

# Draft Integrated Resource Plan 2018 Assessment Framework

BEPA has evaluated the Draft IRP 2018 against a framework. The IRP is the National Electricity Plan (subset of the National Energy Plan). The framework is based on various energy, electricity and other relevant legislation and policies

01

## Ensure security of supply

- Adequacy and reliability of resources and infrastructure
- Accessibility and geopolitical sovereignty
- Resilience

02

## Affordable + accessible electricity for all (minimise cost of energy)

- Standardised financial evaluation of technology options
- Promote technology options that are accessible by all

03

## Promote creation of jobs, skills development and industrialisation

- High skills development impact
- High number of sustainable and quality jobs (eliminate poverty and reduce inequality)

04

## Promote environmental sustainability and conservation of water

- Lowers carbon, nitrogen oxides and sulphur dioxide emissions
- Optimise natural resource consumption
- Improved human health outcomes

05

## Diversify supply sources and promote energy efficiency

- Include a balanced supply sources and primary sources of energy
- Include energy efficiency and demand side management policies

06

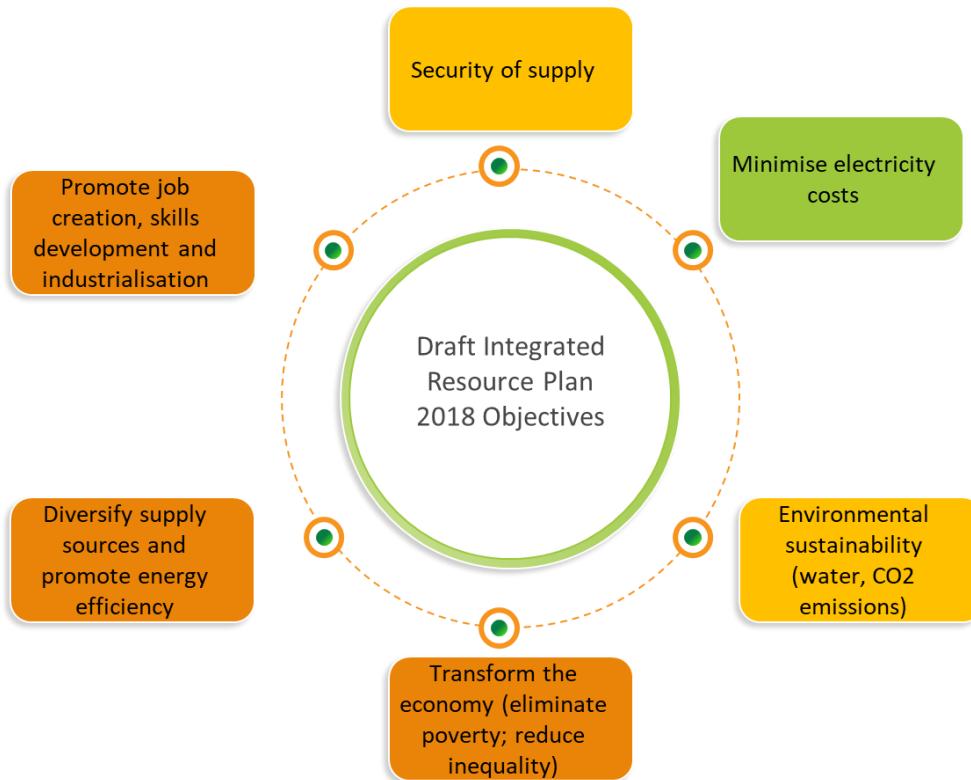
## Transform the economy (eliminate poverty + reduce inequality)

- Drive inclusive participation considering South Africa's history

## Means

- Reduce import dependency
- Reduce production volatility
- Diversify energy mix and suppliers
- Financial evaluation using LCOE and overnight capital cost
- Utilise established electricity infrastructure and drive electricity use
- Develops high quality skills
- Develop high paying jobs
- Creates sustainable jobs and not short term jobs
- Introduce technologies that lower emissions
- Uses supply sources and primary sources that produce more energy per resource
- Minimize sicknesses, disease and death
- Includes Nuclear, Coal, PV, Wind, Hydro, Pumped Storage, CSP, Gas, Embedded Generation and Other technologies
- Considers EEDSM initiatives
- Maximizes positive GDP, fiscal revenues and balance of payments impact
- Includes black people in procurement of government initiatives

# Current Draft Integrated Resource Plan 2018 Falls Short



**A** NDP Eliminate poverty and reduce inequality by 2030

**B** NDP envisions and energy sector that promotes:

- i) Economic growth and development through adequate investment in energy infrastructure
- ii) Reliable and efficient energy service at competitive rates
- iii) Supporting economic growth through job creation
- iv) Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households
- v) Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change

**NDP**

**A** The NDP is aligned the White Paper, National Energy Act, Integrated Energy Plan, Electricity Regulation Act, and Energy Security Master Plan - Electricity

**B** Draft IRP is not aligned to NDP and other legislation and policies

**B** The Draft IRP does not deal with how other issues have been evaluated

**Does not present a balanced IRP**

March 2016						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Planning horizon up till 2030 is insufficient

The IEP which the IRP is a subset of and the NEA require a minimum planning period of 20 years.

A planning period till 2050 is suggested in line with draft IRP 2016



# The Draft IRP 2018 Presents a Significant Deviation

## Promulgated IRP 2010

	Total capacity		Capacity added (including committed) from 2010 to 2030		New (uncommitted) capacity options from 2010 to 2030	
			MW	%	MW	%
	Coal	OCGT	CCGT	Pumped Storage	Nuclear	Hydro
Coal	41071	45.9	16383	29.0	6250	14.7
OCGT	7330	8.2	4930	8.7	3910	9.2
CCGT	2370	2.6	2370	4.2	2370	5.6
Pumped Storage	2912	3.3	1332	2.4	0	0.0
Nuclear	11400	12.7	9600	17.0	9600	22.6
Hydro	4759	5.3	2659	4.7	2609	6.1
Wind	9200	10.3	9200	16.3	8400	19.7
CSP	1200	1.3	1200	2.1	1000	2.4
PV	8400	9.4	8400	14.9	8400	19.7
Other	890	1.0	465	0.8	0	0.0
Total	89532		56539		42539	

## Draft IRP 2018

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (Cogen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433					114	300			200
2021	1 433					300	818			200
2022	711					400				200
2023	500									200
2024	500									200
2025						670	200			200
2026						1 000	1 500		2 250	200
2027						1 000	1 600		1 200	200
2028						1 000	1 600		1 800	200
2029						1 000	1 600		2 850	200
2030				2 500		1 000	1 600			200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

  Installed Capacity  
  Committed / Already Contracted Capacity  
  New Additional Capacity (IRP Update)  
  Embedded Generation Capacity ( Generation for own use allocation)

- The Draft IRP 2018 differs significantly from the Promulgated IRP 2010 which is aligned to the NDP and other legislative and policy documents.
- It looks more like a new plan than an update of IRP 2010
- The Draft IRP 2018 removes key technologies that have high job creation; industrialization; localization; and economic development potential

# The Draft IRP 2018 Should Be Re-Aligned To SA's Objectives and International Developments

South Africa need to base our investments in infrastructure based on where we want to be

**Government is implementing interventions to stimulate the economy. The assumed GDP growth forecasts in the IRP results in the NDP not achieving its objectives**

Eradicate poverty and reduce inequality

The current GDP growth in the Draft IRP 2018 means South Africa has decided that we cannot eradicate poverty and reduce inequality as per the NDP

Look at what other similar countries are doing

South Africa should consider what similar countries like Australia and South Korea are doing.

South Korea was industrialized on the back of Nuclear Power

South Africa is a developmental state

Other developmental states within the BRICS grouping are investing in a balanced mix of Coal, RE and nuclear

UAE are rich in gas and diesel. They are diversifying into RE and nuclear

Australia has recently rejected removing coal from its energy mix due to the potential devastating impact of such a move on its economy. Australia is dedicated to improving cleaner coal technologies to improve the environmental sustainability of coal

# A Balanced Scenario Should Be Adopted

The International Energy Agency Warns against using cost as the primary or only method when comparing electricity generation costs

## **The Promulgated IRP 2010 took a balanced view**

- IRP 2010 applied a Revised Balanced Scenario (RBS)
- The RBS emphasised that the IRP needed to take both quantitative and qualitative factors into account

## **Policy adjustments were made**

- Policy adjustments were made to include PV, Wind and CSP as a result of RBS
- This allowed costs to come down
- This is reflective of constantly evolving technology and costs

## **Qualitative factors considered in IRP 2010**

- Reducing carbon emissions;
- New technology uncertainties such as costs, operability, lead time to build etc,;
- Water usage;
- Localisation and job creation;
- Southern African regional development and integration; and
- Security of supply.

## **After the recommended changes to the qualitative evaluation, similar policy adjustments should be made**

- The quantitative evaluation should be revisited based on the comments received
- The revisions should be aligned to IRP 2010 qualitative factors and the factors outlined in this presentation

# Ensuring security of supply

01

## Coal

- The most important measure of security of supply for coal is import dependency
- South Africa has an abundance of coal [> than 66,7bn tons; > than 150yrs; 5<sup>th</sup> largest exporter]
- Coal provides more than 70% of South Africa's primary energy and a 3<sup>rd</sup> of liquid fuels
- Highly resilient to weather and climate conditions
- Most coal fields are located where grid infrastructure exists
- Provides good base load power and has a high level of reliability

02

## Nuclear

- South Africa has the 6th largest uranium reserves globally (449k tons) which are largely untapped
- South Africa is the 2nd largest global producer of Zircon, a key nuclear energy input
- An abundance of fuel resources lowers geopolitical risk factors
- Nuclear is highly resilient to weather and climatic conditions
- Provides good base load power and a high reliability factor
- Can easily be connected to the grid with some infrastructure development near coastal areas

03

## Hydro

- South Africa is a water scarce country with limited hydro power resources
- Suggested importation of Hydro from the DRC reduces efficiency due to long distances + adds geopolitical risk
- The importation of hydro power will require extensive grid infrastructure development

04

## PV and CSP

- Supply of electricity is weather dependent.
- Low capacity factors
- Limited control over dispatchability
- SA has an abundance of solar resources but highly intense solar is not close to load centres
- Small and sparse systems are difficult to connect to the grid

# Ensuring security of supply

05

## Wind

- Supply of electricity is weather dependent.
- Low capacity factors
- Limited control over dispatchability
- SA has an abundance of wind resources but highly intense wind is not close to load centres
- Small and sparse systems are difficult to connect to the grid

06

## Gas

- Combined Cycle gas plants can provide peak and baseload power and are highly dispatchable
- There are currently extremely limited local gas resources with the potential for shale gas not yet established
- Plants can easily be deployed anywhere

07

## Embedded Generation

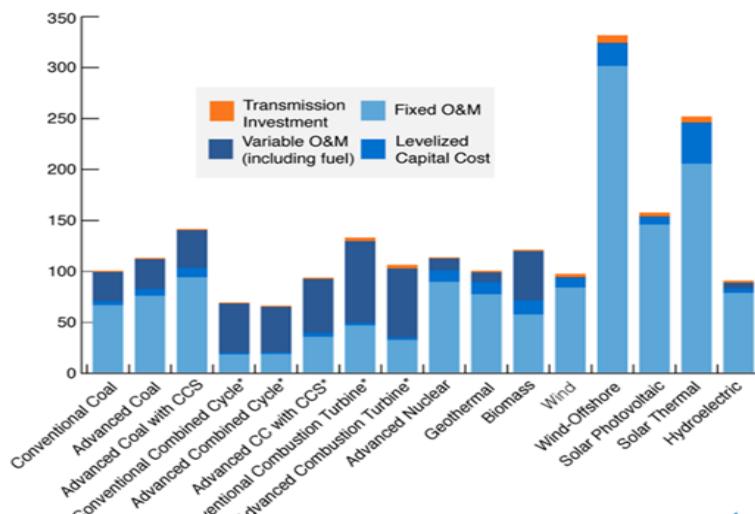
- Primarily PV technology is used in residential and other forms of embedded generation
- Has similar security of supply concerns as PV and CSP

# Affordable + accessible electricity for all (minimise cost of energy)

A standardised method should be used to compare the technology options

- The draft IRP 2018 should include a clear explanation for the definition of least cost that is used
- The IRP should include the LCOE as an alternative means of assessing the cost of the technologies

Estimated Levelized Cost of New Electric Generating Technologies in 2017 (2010 \$/megawatthour)



\*Natural Gas Technologies

Source: Energy Information Administration, Annual Energy Outlook 2012,  
[http://www.eia.gov/forecasts/aeo/electricity\\_generation.cfm](http://www.eia.gov/forecasts/aeo/electricity_generation.cfm)



- A study on the recent global levelized cost for generating technologies, places PV and Wind as the most costly technology options
- The cost assessment should factor in the life of the plants
  - PV, CSP, Gas and Wind are cheaper to build but also have a shorter life period
  - Coal and Nuclear are more expensive but the plants last longer
- Grid operator costs of each technology option should be considered (i.e. ancillary service costs, etc).
- Renewable Energy IPP costs do not take into account spinning reserve costs of keeping load in the transmission system to allow for renewable power to be injected into the grid
- Risks should be priced into the costs

# Promote creation of jobs, industrialisation and localisation

01

## Coal

- 80 000 people employed directly in coal mines
- 160 000 people indirectly employed by coal industry
- Affects up to 1 000 000 people
- Could result in a loss of 29 000 jobs if decommissioning goes ahead with revenues decreasing by R60bn
- Highest mining commodity income generator
- Decommissioning will collapse Mpumalanga and Limpopo economies

02

## Nuclear

- Koeberg currently supports 64 000 jobs annually
- Necsa currently directly employs 1 900 people who will lose their employment if the nuclear industry is allowed to collapse
- 9.6GW of nuclear has the potential to create 617k to 1,7mn jobs

03

## Hydro

- Limited potential for job creation, industrialization and localization in South Africa

04

## PV and CSP

- Together with wind employs 1 883 people directly for combined installed capacity of 3 754MW
- Large portion of jobs are exported as equipment is imported
- Created jobs are intermediate and low skills level
- Majority of jobs created are in construction
- Jobs in operations are mostly manual labour with lower income potential

# Promote creation of jobs, industrialisation and localisation

05

## Wind

- Together with wind employs 1 883 people directly for combined installed capacity of 3 754MW
- Large portion of jobs are exported as equipment is imported
- Created jobs are intermediate and low skills level
- Majority of jobs created are in construction
- Large scale wind project can create a maximum of 150 jobs

06

## Gas

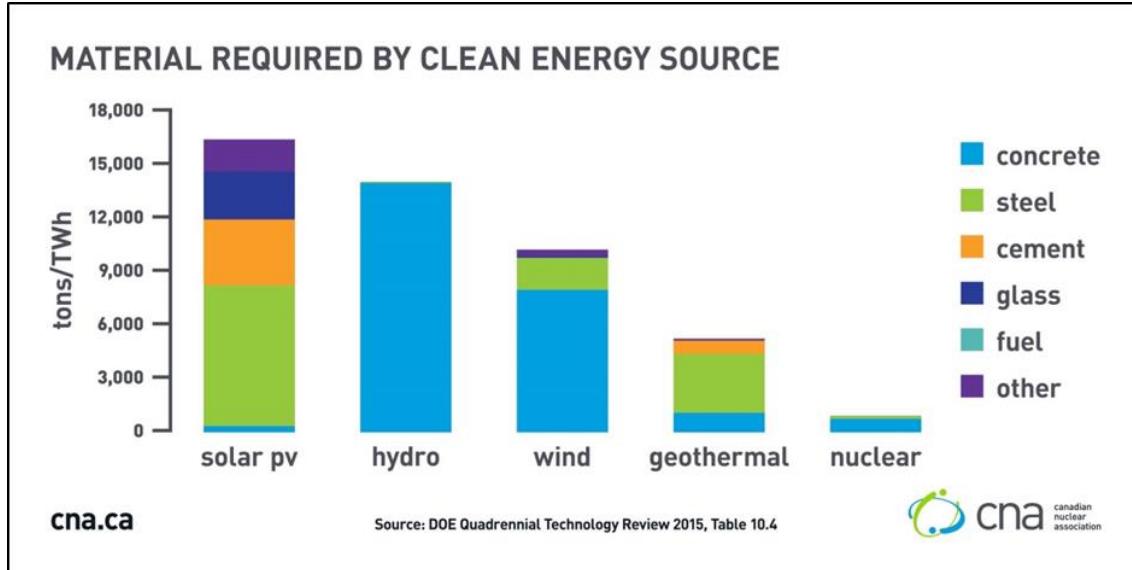
- Limited potential for job creation, industrialization and localization in South Africa

07

## Embedded Generation

- Implementation of the NSWHP has potential to create 21 000 direct jobs (excluding incident management)
- Will result in the development of a SWH industry and create a market for black plumbers
- Can potentially contribute R120bn to the economy on government spend of R12bn

# Promote environmental sustainability and conservation of water



	(2005-2010, euros per MWh)									
	Nuclear	Coal IGCC	Lignite IGCC	Gas CCGT	Hydro (dam)	Wind ON	Wind OFF	Solar PV	Biomass (straw)	Biomass (wood)
Human health	1.55	8.35	3.84	4.24	0.57	0.75	0.72	6.58	15.55	4.64
Loss of biodiversity	0.09	0.79	0.32	0.52	0.02	0.04	0.03	0.34	2.94	0.49
Crops (N, O <sub>3</sub> , SO <sub>2</sub> )	0.02	0.15	0.04	0.12	0.01	0.01	0.01	0.07	0.10	0.13
Materials (SO <sub>2</sub> , NO <sub>x</sub> )	0.03	0.11	0.03	0.07	0.01	0.01	0.01	0.09	0.12	0.07
Radionuclides	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change	0.43	17.6	19.57	8.97	0.16	0.21	0.17	1.81	1.46	1.20
<b>Total</b>	<b>2.14</b>	<b>26.96</b>	<b>23.80</b>	<b>13.93</b>	<b>0.76</b>	<b>1.03</b>	<b>0.94</b>	<b>8.88</b>	<b>20.17</b>	<b>6.54</b>

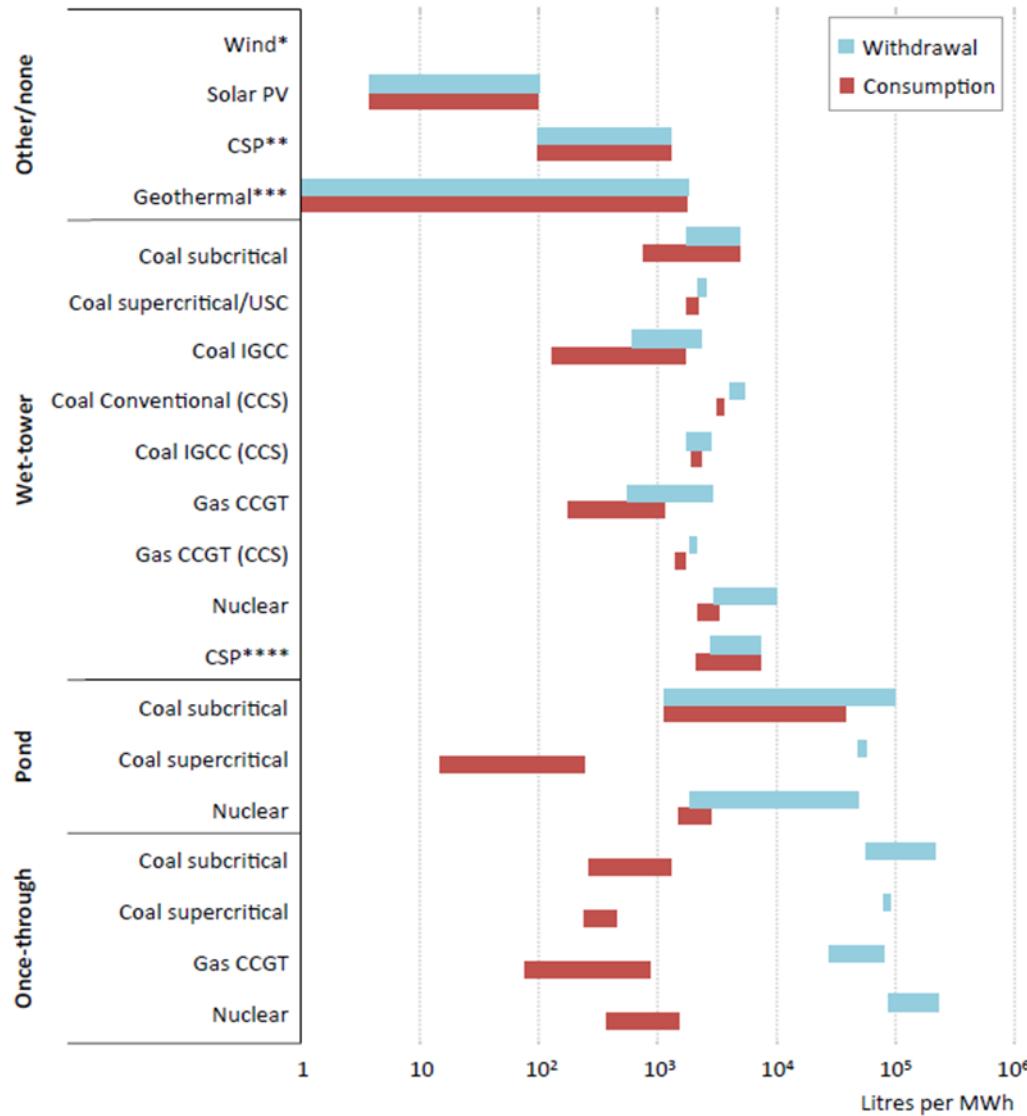
N: nitrogen; NO<sub>x</sub>: nitrogen oxides; O<sub>3</sub>: ozone; SO<sub>2</sub>: sulphur dioxide.

\* This table should not be construed to reflect a definite consensus view on the external costs of electricity. External cost accounting, by its very nature, will always allow for alternative viewpoints. Coal, for instance, does emit a higher level of radionuclides than nuclear energy. The estimate of the impacts of hydroelectricity on biodiversity seems small when compared to anecdotal evidence. Such uncertainties show that more systematic as well as policy-relevant research on the external costs of power generation is needed.

Source: Adapted from FEEM, 2011.

- CO2 emissions
  - Coal: 1000g/kWh
  - Nuclear: 16g/kWh
  - Hydro: 4g/kWh
  - PV: 46g/kWh
  - CSP: 22g/kWh
  - Wind: 12g/kWh
  - Gas: 469g/kWh
  - Embed Gen (PV): 46g/kWh
- Based on the European Cases project, nuclear, hydro and wind have the lowest cost on human health, loss of biodiversity, crops, materials, radiances and climate change
- Nuclear and Wind result in the least number of deaths per TWh

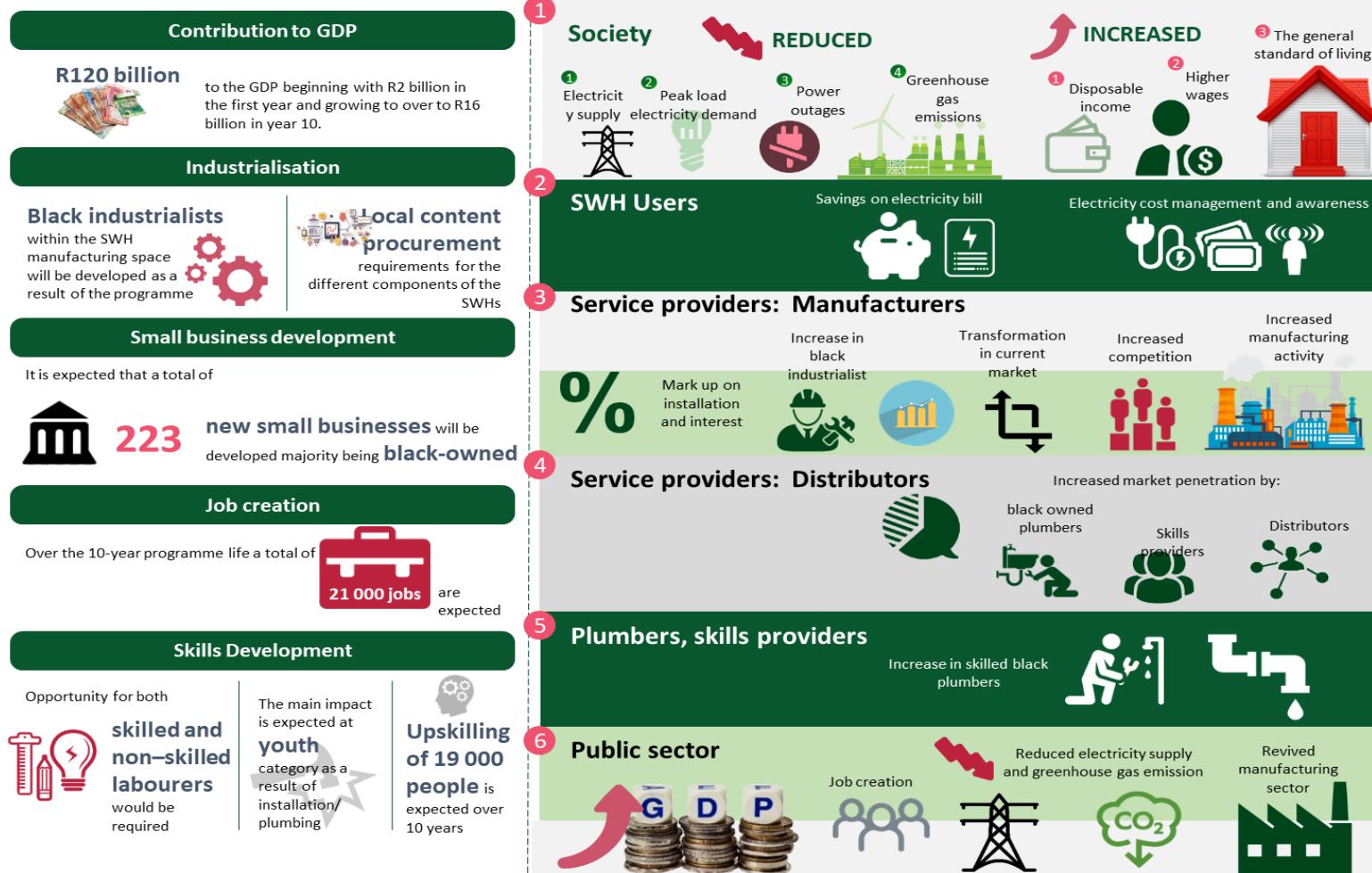
# Promote environmental sustainability and conservation of water



- Nuclear power plants tend to consume more water per unit of energy than coal or natural gas plants
- South Africa's nuclear plants are by the sea and the use of seawater has a negligible impact on the fresh water resources
- CCGT have some of the lowest rates of water consumption among thermal power plants
- A common misconception is that switching to a lower carbon pathway would reduce water requirements.
- The use of clean energy technologies can increase or decrease water demand depending on the technology employed
- Depending on the cooling technology, CSP's and geothermal water consumption can be of the same order as conventional power plants

# Diversify supply sources and promote energy efficiency

Embedded generation through the NSWHP has the largest potential for promoting energy efficiency



# Transform the economy (eliminate poverty + reduce inequality)

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Whichever technology option is selected it must transform the economy

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## Black Participation

- There is still inadequate participation of black people in the energy industry
- The REIPP Programme, although it was a new industry sector in South Africa saw minimal black participation in the Programme
- Black people were mostly empowerment partners in a fledgling industry
- Most of the participants are international EPC companies
- Issues faced include access to land and capital
- If we do not deal with this the NDP goals of eliminating poverty and reducing inequality will not be addressed