WCB ENGINEERING BULLETIN

Vol.29 No1

The Institution of Certificated Mechanical and Electrical Engineers South Africa
Western Cape Branch (WCB)

MARCH 2020

MISSION STATEMENT: 1. To uphold the image and status of the Certificated Engineer. 2. To represent the Certificated Engineer at ECSA and other decision-making bodies concerning legislation, safety & health standards, the environment and the machinery regulations. 3. To promote continued education and training of its members and future engineers. 4. To promote fellowship in the engineering profession.

EDITORIAL

Welcome to the latest edition of the Western Cape News Bulletin.

In this strange situation we all find ourselves in with the national Lockdown due to the COVID-19 Pandemic, we would like to wish all our members a safe and healthy year further. We will come out of this pandemic and start with the catch up situation in our homes, factories, offices and all work places.

This is indeed a very full edition of our Bulletin!

One of our Past Presidents, Mr Brian French, President in the year 2000, passed away in February and we include a eulogy to comemorate his life.

In this issue, we have the normal Questions and Answers for Factories and two sets of Mining GCC examinations. The continuation of the "Lighting up the fairest Cape 1895 to 1995" with part 43 of the series.

There are two reports on visits, one to Associated Transformer Manufacturers and the second to True Cape fruit processing works.

The Branch held its AGM in March and John Davidson presented a talk which he has produced in two parts, with Part 1 included in this bulletin.

Some ECSA news is shared with Registered members in the form of two E-Bulletins and a Note warning members to be aware of service providers impersonating the ECSA brand on CPD activity material.

Any contributions to future editions of this Bulletin from members would be welcome.

I trust that you will find the content of this news bulletin interesting enough to pass on to your colleagues and friends.

Chris Schnehage
chris@icmeewc.co.za

News JUST IN! Email from secretary of Commissioner of Examiners re the June Government Certificate of Competency Examination for Factories. Copy of email included.

LOCAL BRANCH NEWS

Activities of the Western Cape Branch since the last Bulletin were as follows:

- On 12 November 2019 a group of us visited Associated Transformer Manufacturers in Stikland. Schalk Burger was our host and he really put on a good presentation followed by a tour of the factory.
- On 11 February we had a visit to True Cape fruit producers in Grabouw. There were 12 of us who enjoyed the interesting visit and walked about the plant. Most interesting was the Dynamic Controlled Atmosphere processes.
- On 3 March we held our AGM at Thornton venue of College of Cape Town. The AGM was followed by a talk on "Small Scale Electricity Generators using PV" by Committee member John Davidson. 29 members and guests attended the meeting!

We appeal to members who have an interest to please suggest something and assist with arrangements.

Until next time, Ciao for now!

Chris Schnehage
Tel: 083 326 8023
Email: **chris@icmeewc.co.za**

Eulogy to a Past ICMEESA President

Brian Alfred French

Today we take a few moments to remember Brian Alfred French, a Past President of the Institute.

Brian passed away on 4 February 2020 after a short period of illness (mesothelioma of the lungs). The family held a small private memorial service for Brian on 10 February 2020 at the Sungardens Hospice Chapel in Pretoria.

Brian was born on 18 October 1936 in England and was one of the many children evacuated from Britain during the World War II German bombing blitz.

After Brian completed his engineering studies, he emigrated to Northern Rhodesia to work on the copper mines. After a few years of mining he moved his young family to Durban and became a junior engineer at the Toyota factory in Prospecton. During this time, he completed his studies and achieved both the Mining and Factories Government Certificates of Competency. He held Engineering Council registration as a Professional Certificated Engineer since 16 August 1989 (Registration No. 8990091).

Brian had a long and accomplished career with the Factory Inspectorate starting in the Department of Manpower and Utilization (name before Department of Labour) in Durban in the 1970's and went on to lead the Port Elizabeth office before being appointed as Director of Engineering in Pretoria. During this time Brain was directly involved in the drafting of the MOS Act and later the OHS Act and many of the engineering regulations published under these Acts.

Not only was Brian a passionate Engineer but he was also an avid believer in training young engineers. He committed many classroom hours to this cause, and he influenced the lives of many engineers.

Brian lived an active life which saw him running the Comrades Marathon between Durban and Pietermaritzburg, in his younger days. He hiked the many trails in our South African National Parks and ultimately hiked the Annapurna in the Himalayas with his wife, Delveen.

He was always committed to the task and no short measure was good enough, whether it was for fun or business and he was always ready to be counted when it was required. He was a natural leader and an inspiration to many.

We remember Brian Alfred French, a past President of the ICMEESA.

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Email from the Secretary: Commission of Examiners

From: Matlala Sathekge (HQ) <Matlala.Sathekge@labour.gov.za>
Sent: Friday, 08 May 2020 09:22
To: Mariana Jacobs (mariana.jacobs@icmeesa.org.za) <mariana.jacobs@icmeesa.org.za>
Subject: Postponement of the June 2020 Government Certificate of Competency Examination for Factories
Importance: High

Good Day All

The Department of Employment and Labour is hereby notifying all the Government Certificate of Competency Candidates for Factories that the June 2020 examinations are postponed due to the COVID-19 National Lockdown.

Once the Minister for Higher Education and Training has announced the reopening of the institutions of higher learning and the new examination dates are available through the TVET Colleges, we will proceed with the examinations you have entered.

For further enquiries, kindly contact Ms. Matlala Sathekge at 079694 74 88 or matlala.sathekge@labour.gov.za

or

Mr. Leema Mofokeng at 066 566 1379 or leema.mofokeng@labour.gov.za

Ms Matlala Sathekge
Secretary: Commission of Examiners for Government Certificate of Competency
Specialist: Mechanical Engineering
Directorate Electrical & Mechanical Engineering

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Letter from ECSA

ENGINEERING COUNCIL OF SOUTH AFRICA

ECSA
ENGINEERING COUNCIL OF SOUTH AFRICA

21 February 2020

Dear Registered Stakeholder,

It has come to the attention of the Engineering Council of South Africa (ECSA) that certain providers have been impersonating our brand on CPD activity material in order to extort money from unsuspecting ECSA registered persons.

To avoid being misled by these unscrupulous providers, please note the following:

- All activities validated for the ECSA CPD program are listed on the ECSA's website.
- The validation number of the CPD activity can be obtained from the activity provider or from the marketing material of the activity.
- The validity of the activity can be verified by visiting following link: https://engineeringcouncilsa.microsoftcrmportals.com/cpd-activities/ and using the validation number in the search field.
- If no information is returned; the activity is not validated and therefore cannot be recorded under Category 1: Development Activities.

ECSA therefore respectfully request that all registered persons first confirm the validity of the CPD activity for Category 1: Developmental Activities before making payment to any activity provider.

If you require any further assistance or suspect any foul play, please call us on 0861 225 555, send an email to engineer@ecsa.co.za.

Yours faithfully,

Carmen Wright (Ms)
Manager: Education and CPD
Note: This letter is copied as pdf version was unclear. Editor

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ECSA E-Bulletins
During the past few months there have been two issues of ECSA's E-Bulletin. In case you are interested to follow what ECSA is getting up to, please copy and paste the Links below in your Web Browser:

https://drive.google.com/file/d/17y_O40Z7NDG0NM0FQHINDo5GLEbehVd3/view
November 2019 edition

https://ecsa.papertrail.co.za/public/file/195945340/ECSA%20E-Bulletin%20Issue5.pdf
March 2020 edition

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HSAct. Nov. 2013 (5) (GMR)

5.1 Define a competent person who has to be appointed to supervise machinery where the sum of the power of the machinery on the premises is 2 000 kW. **[2]**

Answer: GMR See definitions

5.2 The sum of power generated by the machinery on your factory premises is 4 000 kW.
The vacant post of the competent person was advertised but you were not successful to attract a certified engineer. A person with suitable experience on your type of plant and who has been accepted as a candidate for the Certificate of Competency applied. You consider his appointment seriously but have to apply for an exemption from the minister to appoint him.

Name THREE particulars you have to submit with your application for exemption. **[3]**

Answer: GMR 2(11)(a)(b)(c)(d)(e)(f)

5.3 A person has to carry out work in close proximity to moving machinery.
What is he/she not allowed to wear? **[2]**

Answer: GMR 5(3)

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Jorge Pereira GCC Preparation Classes (Pty) Ltd.
GCC Part-time classes in Cape Town
For details contact Jorge Pereira at
082 896 8489 or ***jorgepereira43@yahoo.co.za***

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Plant Eng. Nov. 2019 (8.1)

The power supplied to a three-phase induction motor for a refrigeration plant is 50 kW and the corresponding stator losses are 1,5 kW.
Calculate each of the following:

8.1.1 Total mechanical power developed and the rotor I^2R loss when the slip is 0,04 per unit. **[4]**
8.1.2 Output power of the motor if the friction and winding losses are 0,8 kW. **[2]**
8.1.3 Efficiency of the motor **[2]**

NOTE: Ignore the rotor iron loss.

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Suggested answer:

8.1.1

$$P_2 = 50 - 1.5 = 48.5 \text{ kW}$$

$$P_{mech} = (1 - 0.04) \times 48.5 = 46.56 \text{ kW}$$

$$P_{I^2R} = 48.5 \times 0.04 = 1.94 \text{ kW}$$

8.1.2

$$P_{out}\ 46.56 - 0.8 = 45.76 \text{ kW}$$

8.1.3

$$\eta = \frac{45.76}{50} = 91.52\%$$

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Plant Engineering: MINES mechanical question

Question (June 2005)

The retardation period of a winder is designed to bring the conveyance to rest at its normal stopping point with a uniform retardation of 0.9 m/s^2 from an initial speed of 15 m/s.

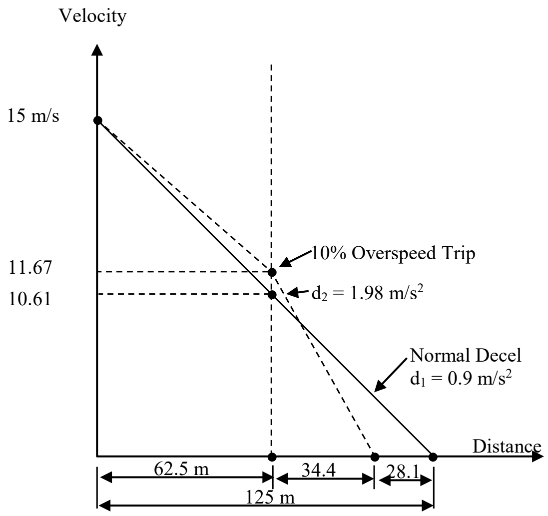
The overspeed trips are set to operate at 10% of the operating speed and come into operation when the conveyance has covered exactly one half of its normal distance of retardation and thereafter a uniform retardation of 1.98 m/s^2 is immediately imposed.

Determine the distance from the normal stepping point at which the conveyance will come to rest.

[10]

Proposed Solution:

u_1 = 15 m/s (initial speed)
a_1 = 0,9 m/s^2 (normal retardation)
Trip = 10% above normal speed
s_1 = ½ × Normal speed for retardation
a_2 = 1,98 m/s^2 retardation after trip
v_2 = 0 m/s
s_3 = distance from normal terminal until conveyance comes to rest



During normal retardation:

Distance travelled, s

$$s = \frac{(v^2 - u^2)}{2a} = \frac{(0^2 - 15^2)}{2(-9)} = 125 \text{ m}$$

On overspeed trip:

$$s_1 = \frac{1}{2s} = \frac{1}{2} \times 125 = 62.5\text{m}$$

Normal speed of conveyance

$$v_1 = \sqrt{(u^2 + 2as_1)} = \sqrt{152 + (2 \times [-9] \times 62.5)} = 10.61 \text{ m/s}$$

Actual speed of conveyance at 10% overspeed = 1.1 × 10.61 = 11.67 m/s

After overspeed trip

Distance travelled, s_2

$$s_2 = \frac{(v^2 - u^2)}{2a} = \frac{(0^2 - 11.67^2)}{2(-0.98)} = 34.4\text{m}$$

Distance of normal terminal where conveyance will come to rest, s_3:

$$s_{total} = s_1 + s_2 + s_3 \therefore s_3 = s_{total} - (s_1 + s_2) = 125 - (62.5 + 34.4) = 28.1\text{m}$$

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A Legal Knowledge: MINES question

Question (November 2019):

List ten rail infrastructure requirements for rail bound installation as per the rail bound equipment guideline. [10]

Proposed answer

Rail track installation

a) Rail mass (kilogram per metre);
b) Rail gauge and tolerances (millimetre);
c) Rail sleeper types (wood, concrete steel etc.);

d) Rail sleeper spacing standards (millimetre);
e) Fish plate type and design;
f) Method of securing rails to sleepers (e-type, dog spike etc.);
g) Welding of rails joints if applicable;
h) Maximum permissible rail joint gaps (millimetre);
i) Maximum permissible rail joint horizontal alignment (millimetre);
j) Maximum permissible rail joint crown height difference (millimetre);
k) Provisions for drainage;
l) Ballast type;
m) Rail switch type (single tongue, double blade etc.);
n) Rail switch methods of operation (tumbler, lever etc.);
o) Rail switch dimensions (millimetre).

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Plant Engineering: MINES mechanical question

Question (June 2003)

8.2 The electrically driven crab of an overhead crane can lift a mass-load of 5 000 kg. Its traversing speed is 0,375 m/s; its own mass is 2 500 kg. The traversing drive has no mechanical brake and depends solely on electrical braking assisted by the resistance of the wheels on the track which can be taken as 1 350 N when the crab is fully loaded.

Calculate the maximum distance the crab will travel when fully loaded if, because of a power failure, there is no electrical braking. The relevant features of the traversing drive are as follows:

Moment of inertia of motor armature:	0,04 kg m^2
Speed of motor:	950 rev/min
Diameter of wheel:	250 mm

The wheels are driven by double reduction gears with ratios of 18 to 110 and 15 to 82 and the efficiency of gearing is 85%. [10]

Proposed Solution:

Let linear deceleration = a m/s^2

$$\text{deceleration of wheel, } \omega_w = \frac{a}{\text{radius of the wheel}} = \frac{a}{0.250/2} = \frac{a}{0.125} = 8a \text{ rad/s}^2$$

$$\text{overall gear ratio} = \text{ratio}_1 \times \text{ratio}_2 = \frac{110}{18} \times \frac{82}{15} = 33.4 \text{ to } 1$$

$$\text{deceleration of armature, } \omega_w = \text{overall gear ratio} \times \omega_w = 33.4 \times 8a = 267a \text{ rad/s}^2$$

$$\text{deceleration armature torque, } T_a = I \times \omega_a = 0.04 \times 267a = 10.67a \text{ Nm}$$

Now calculate the torque on wheels neglecting gearing efficiency

$$T_w = T_a \times \text{overall gear ratio} = 10.68 \times 33.4a = 357a$$

$$\text{force on wheel periphery, } F_w = \frac{Tw}{r_w} = \frac{357a}{0.125} = 2856a$$

Since gearing provides a decelerating force, the required force on the wheel periphery to decelerate the armature is:

$$F_a = F_w \times \eta_{gear} = 2856a \times 0.85 = 2428a \text{ N}$$

Mass subject to linear deceleration:

$$m_{crane} = m_{load} + m_{crab} = 5000 + 2500 = 7500 \text{ kg}$$

$$\text{decelerating force, } F_{crane} = m_{crane} \times a = 7500a \text{ N}$$

$$\text{Total decelerating force} = F_{crane} + F_a = F_{track}$$

$$\therefore 7500a + 2428a = 1350$$

$$\therefore a = \frac{1350}{(7500 + 2428)} = 0.136 \text{ m/s}^2$$

From $v^2 = u^2 + 2as$, but the final velocity v = 0

$$\therefore s = \frac{-u^2}{2a}$$

$$u^2_{traversing} = 2as \therefore s_{on\ power\ failure} = \frac{-u^2_{traversing}}{2a} = \frac{-(0.375)^2}{2 \times -0.136} = 0.517 \text{ m}$$

Note: a is negative as it is a deceleration

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A Legal Knowledge: MINES question

Question (November 2019):

5.1 You are appointed as an engineer responsible for a crushing plant, what hierarchy of controls will you put in place in line with risk management principles? (2)

5.2 An inspector may give any instruction necessary to protect the health or safety of persons at the mine in terms of Section 54 (1) of the MHSA.

Name FOUR instructions that an inspector may issue at the mine, when he/she has a reason to believe that any occurrence, practice or condition at the mine endangers or may endanger the health and safety of persons.

(8) [10]

Proposed answers

5.1 Control of the risk (using a hierarchy of control measures consisting of [in order of preference]):

a) Elimination
b) Substitution
c) Isolation
d) Engineering controls
e) Administrative controls (SOPs, training)
f) Personal Protective Equipment

5.2 Inspector's power to deal with dangerous conditions

(1) If an inspector has reason to believe that any occurrence, practice or condition at a mine endangers or may endanger the health or safety of any person at the mine, the inspector may give any instruction necessary to protect the health or safety of persons at the mine, including but not limited to an instruction that-

(a) operations at the mine or a part of the mine be halted;

(b) the performance of any act or practice at the mine or a part of the mine be suspended or halted, and may place conditions on the performance of that act or practice;

(c) the employer must take the steps set out in the instruction, within the specified period, to rectify the occurrence, practice or condition; or

(d) all affected persons, other than those who are required to assist in taking steps referred to in paragraph (c) be moved to safety.

Visit to Associated Transformer Manufacturers on 12 November.

A group of members and friends visited Associated Transformer Manufacturers (ATM) in Stikland on 12 November 2019 where our host, Schalk Burger, arranged for two speakers on various topics and followed by a visit into the factory to take a look at a few transformers being built. There were 16 members and guests present and unfortunately no young engineers! Where are they?

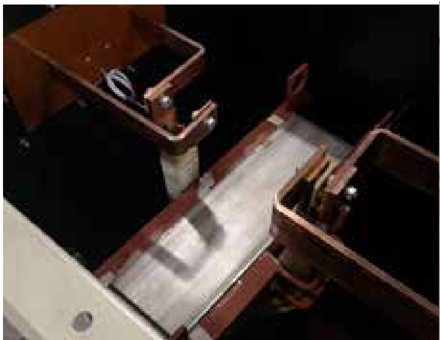
The first discussion was on Solar System installations to supply electricity for own consumption and to take a business off the grid. The company STI Energy put together a performance-based long term contract which does not expose you to any technical or performance risk on your solar plant for 20 years. The plant is built by the contractor and you start paying a solar bill once the solar plant starts producing electricity. This is a Build-Operate-Transfer model - the solar plant will belong to the business at the end of the 20 year period.

Process is submitting 12 months utility electricity bills after which a proposal is produced and once signed a design and build of the solar plant takes place. STI Energy then operates and maintains the plant and after 20 years the plant is handed over to the customer.

This was followed by a most interesting talk (informal and light chat) by Dennis Farge on Harmonics and the effect on your power system installation. The particular focus was modern machines and equipment including PV installations on harmonics and consequences. There was too much detail to repeat here.

Schalk Burger, our host, then gave a talk on ATM and the types of transformers that are manufactured here. Focus on testing of transformers before despatch to customers. We then did a tour of the factory.

Thank you Schalk for putting together such a good evening!







SSEG (Small Scale Electricity Generators) Using PV ("Photo Voltaic" Solar Power): An Introductory Discussion:

PART 1

by John Davidson Pr. Cert Eng.

Introduction: What are the features of SSEG and ESS (energy storage systems)?

There are differing points of view on renewables, depending on who has got what interests, but what is the truth? Does it depend on who is paying for that version of the "truth"? Are they pro renewables or pro fossil fuels Industry or nuclear? Some would have us believe that so called renewable generators such as solar panels (PV) and wind turbines do not recover the energy used to produce and install them, in their lifetimes.

The reality is, that there is certainly space in the energy mix for renewables, and that SSEG is an option in many instances. The supply of electricity has and always will be about having a suitable mix of electricity generation sources on any electricity grid. On a large scale, there is a need for "base load" generation and "peaking" generation, because the demand for electricity is always varying and the supply must be adjusted continuously to ensure the demand and supply are perfectly matched. Large scale renewables are a reality and have an important role to play. The challenge with renewables is the variable nature of electricity production and the vagaries of sun, wind, rainfall etc. That is why ESS is so critical to bring into the mix.

A Domestic SSEG Case Discussion:

As this article is about SSEG, we will focus on this topic, starting with an example of a system in which the author assisted with rehabilitation, particularly the ESS component.

The system had been in service for about three years. The performance of the PV array was well below spec. Maximum power on any given day could not exceed 2.3 kW instead of 4.5kW (rated peak from 15X300W panels). Remember the power ratings on PV panels are for ideal conditions, not what you can expect them to produce in any available daylight. The inverter is rated for 5kW. The Pb batteries (4X200Ah) where not effectively storing any energy due to the poor choice of battery technology and incompetent setup of the sophisticated "Victron" PV system. A reasonable life expectancy for good quality Pb ESS at minimum 70% SOC is about 3kWh. The owner had given up in frustration, of trying to get the original installer to get the system to perform as expected or promised. The average domestic consumption on the premises was of the order of 400 units a month over the indicated interval.

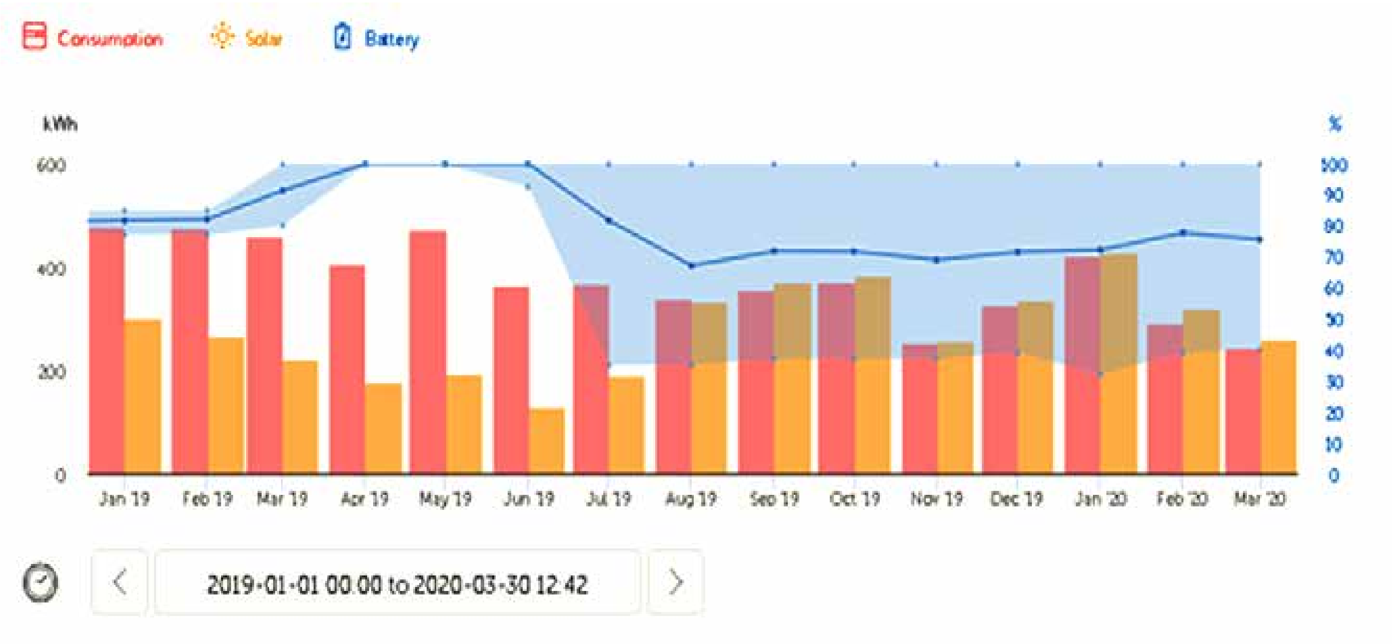


Figure 1: Total consumption vs. PV yield over 13 months. remediation done late July 2019

This is illustrated graphically, by trends where solar yield and an ESS was revised in late July 2019. (Figure 1.). On the left vertical we see monthly consumption in kWh, on the right, the battery "state of charge" (SOC) in %. The red bars indicate total monthly electricity consumption of the load coupled to the SSEG. The yellow bars show what portion of what was provided in the respective month by PV yield. Up to and including July, particularly in the winter months, the Solar yield is less than 50% of consumption. From August, after the rehabilitation, we see the PV yield meets or exceeds the consumption. The difference being probably due to losses in the PV- charger and inverter plus battery charge/discharge efficiency. As we will see later, this system would be classified as a "grid tied, hybrid system without feed in".

It can be concluded that before remediation there was a very small effective battery storage possible with previous PV charger settings (only at about 50% of PV capacity) and Pb ESS not being charged effectively causing a severe compromise to battery life, Pb battery technology life is shortened by the battery not being regularly fully recharged. The solid blue line indicates the average state of charge of the ESS (battery). The shaded region indicating the battery daily cycle and average state of charge (SOC). It can be seen that prior to March 2019, the batteries never reached 100% SOC. This had been the case for almost the entire previous year. Once the new Lithium based ESS with a useable capacity of 8kWh was installed and the system set up correctly, it can be seen that the ESS cycled between 100% and a normal minimum of 40% for most of days in operation. This proper operation of the ESS is critical to make energy available for the hours that PV yield is too low or zero, during darkness.

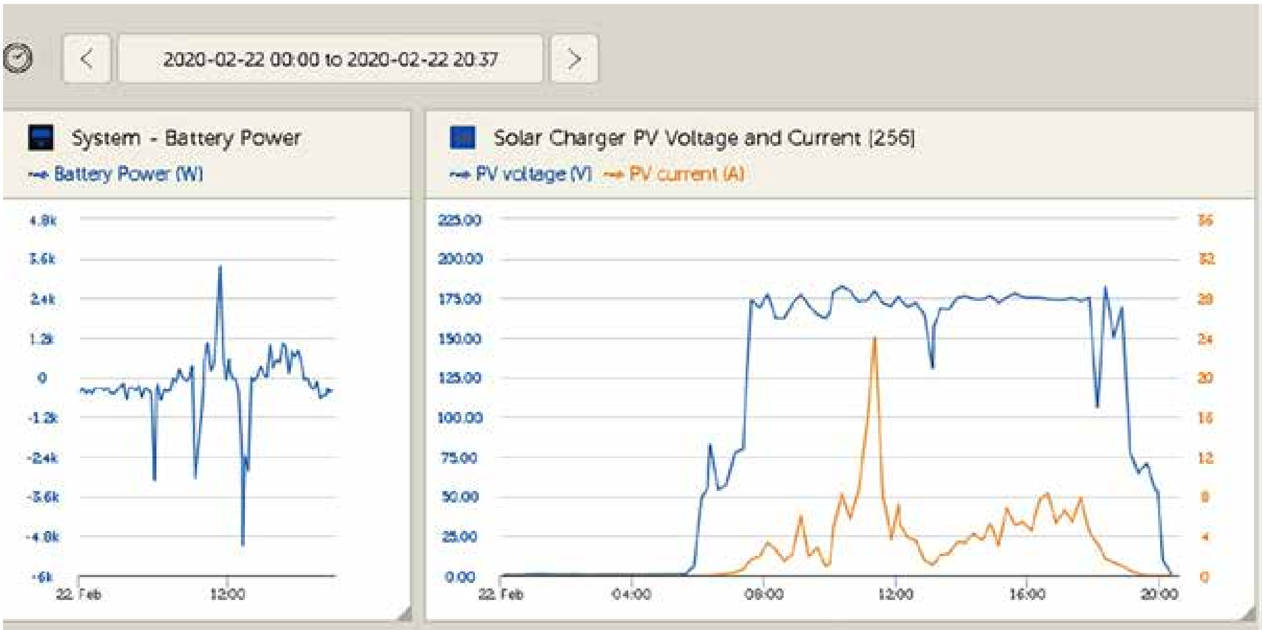


Figure 2. PV Yield during a cloudy day

Figure 2. indicates typical erratic PV yield during a cloudy day. ESS power flow (discharge and charge) over 24 hours on the left and PV array actual voltage and current on the right. The correlation between battery power flow for charging approximates the PV current flow. The large negative battery power flows during the daytime are attributed to domestic electricity demand that could not be met by the available PV capacity at the time, so the system drew this additional power requirement from the batteries for the duration of high demands.

Figure 3. indicates a much stronger PV yield during a sunny day with negligible cloud influence. The PV yield resembles an inverted parabola as the sunlight intensifies towards the middle of the day and then diminishes again towards sunset. It can be seen that the ESS was fully charged by about 14:00 where after the PV current fell below maximum possible yield and only the necessary current delivered to supply the power consumption on the premises, until the ESS was called on to supply during the hours of darkness.

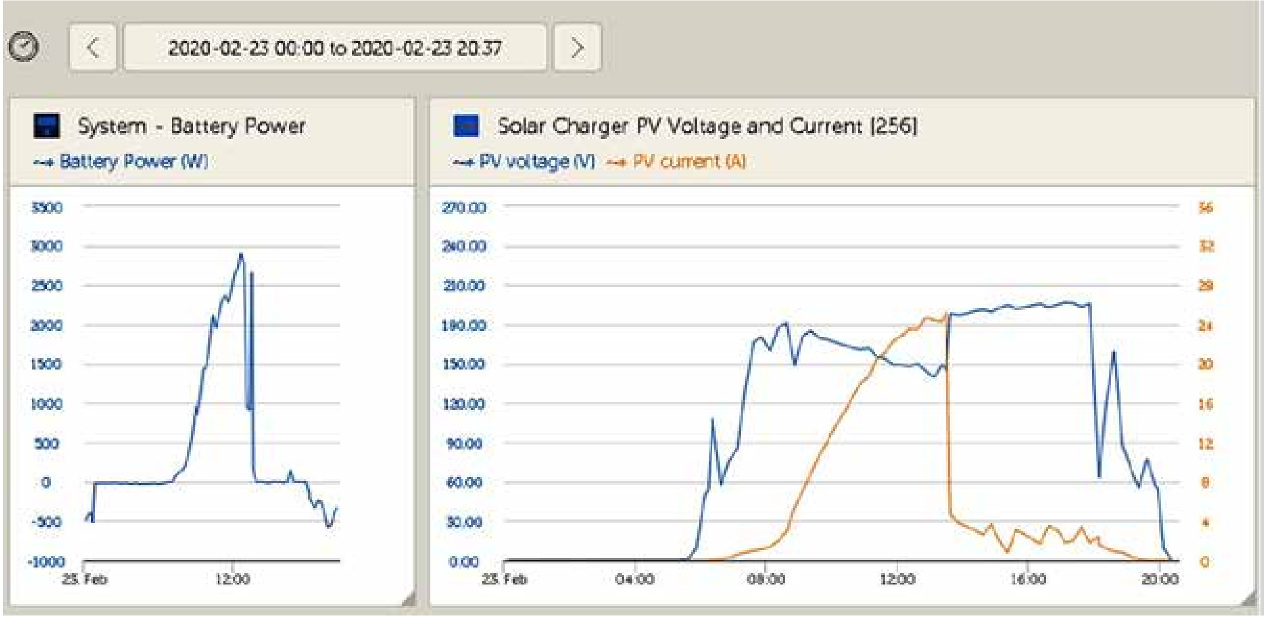


Figure 3. PV Yield during a sunny day.

Types of SSEG PV configurations and applications. A brief overview of some of the technical issues, normative and regulatory standards to be considered.

The City of Cape Town has been the leader in South Africa in formulating a regulatory framework and Bylaw for the SSEG and particularly PV installation in its area of jurisdiction. This means that all ESS that are installed in the City's area of jurisdiction, must be registered with the City authorities. This registration deals with all the aspect to be considered i.e. The various types of Solar Power Systems or Configurations being:
Grid Tied (with or without feed in)
Hybrid (with or without feed in)
Off Grid (no feed in possible)

"Feed in" is the term used to describe the ability and authorisation/contracting required to allow the SSEG to feed power back into the City's electrical grid.

1. **Grid-tied SSEG systems**
   These are connected to the City's electricity grid either directly or through your property's internal wiring. Grid-tied feed-in system (also known as an SSEG with export option): the electricity generated by the PV system is used on the property. Excess electricity generated from the SSEG is fed back into the electricity grid - you may receive credit from the City according to a contract in place.

2. **Hybrid Grid-tied SSEG systems**
   These are identical to the above but with an ESS installed, so only the excess energy that cannot be stored in the ESS may be fed back into the grid.

3. **Grid-tied non-feed-in PV (also known as an SSEG without export option, with reverse power flow blocking):**
   The electricity generated by the PV system is used and or stored (hybrid) on the property only when there is a demand for it. Excess electricity generated is blocked from feeding back into the grid.

4. **Off-grid or standalone SSEG systems**
   These systems have no connection to the grid. They are physically separated and electrically isolated from the grid. An example would be connecting a pool pump directly to a solar PV system instead of connecting it to the building's wiring. Off-grid systems must also be registered with the City to ensure they are not mistaken for grid-tied systems and that they comply with the necessary safety regulations.

Figure 4. Lithium Fe PO 4kWh ESSwith digital battery moniroting system (BMS) with built in digital displays and BMS communication capability for smart charger/inverter systems,

Figure 6. A domestic 650 W PV array.

Figure 5. Domestic 600W ESS: PMMT solar charger top left, 230VAC O/L and E/Lprotection top right, DC DB centre with DC O.C protection for all DC componentsand surge protection on PV array supply for proximity lightingning discharges and the 600W pure sine wave inverter at the botom. This system is completely off grid supplying all home communications, office and entertainment systems.

The City of Cape Town's requirements:
Full access to all of these are available at: http://www.capetown.gov.za/City-Connect/Apply/Municipal-services/Electricity/apply-for-authorisation-to-install-a-small-scale-embedded-generation-system

They apply to Domestic, Commercial and Industrial SSEG. The document downloads are very easy to do and are relevant:

For Grid Tied SSEG applications the first download Application form is required and must be filled in and submitted before even purchasing your SSEG equipment. If going for the off-grid option, then the third download for the relevant "Declaration" is required. It is advised to fill this in before installation, but it only must be submitted immediately after installation and provide all the relevant safety regulations and standards implemented in the installation.

SSEG (Small Scale Electricity Generators) Using PV ("Photo Voltaic" Solar Power): An Introductory Discussion: PART 2, to follow in a future publication, where we shall examine more of the Standards and Regulations that must be complied with for SSEG and deal with some of the reasons for these requirements.

Document downloads

[PDF] **Application for the Connection of Small-Scale Embedded Generation (GEN/EMB)**
01/02/2018, Application form - 405.3 KB

[PDF] **Approved Photovoltaic (PV) Inverter List**
26/03/2020, List - 293.8 KB

[PDF] **Declaration for Off-Grid Small-scale Embedded Generation Form**
01/07/2019, Form - 309.8 KB

[PDF] **Electricity Distribution Licence and Area Boundaries Map**
14/11/2016, Map - 2.2 MB

[PDF] **PV Registration letter to customers**
10/07/2018, Notice - 310.3 KB

[PDF] **Requirements for Small-scale Embedded Generation**
21/08/2017, Guideline - 886.9 KB

[PDF] **Rooftop PV Safe and Legal Installations Guidelines Pamphlet**
09/06/2018, Pamphlet,Guideline - 2 MB

True Cape (Two-a-Day Group) visit 11 February 2020

12 members and guests travelled out to Grabouw to visit True Cape packaging works.
We were introduced to the operation of True Cape and enlightened about the history of the company and the changes through the years of the site with additions in warehousing and processes. Our host was the Engineering Manager, Henk Ryke.

Most interesting was the Dynamic Controlled Atmosphere (DCA) warehouses where the temperature of the atmosphere as dropped to below zero and all oxygen removed from the air. Of interest was also the water recycling and subsequent savings.

The visit was enjoyed by all.

Visiting group

Automatic sorting of fruit

Group in a packaging area

Fruit sorting chutes

Overlooking sorting chutes

Water purification works

Mechanical packing unit at work - impressive machines

Refrigeration plant

Cooling towers

Burping unit of DCA chamber

Picture of inside of DCA chamber through port hole window

Storage area

Control room overlooking the fruit sorting chutes.
The sorting is done automatically with fruit flowing on water and each fruit being exrayed and then dropped into its size chute. This also sorts bad fruit and discards them in a seperate chute. Quite an impressive operation.

Part 43 of "Lighting up the Fairest Cape"

Technical Training

It goes without saying that the strength and success of any electricity undertaking hinges on the technical competence of its staff at all levels.

Within a decade of the founding of the electricity undertaking in 1895, it was realised that with the commissioning of the new Dock Road power station in 1903, some formal training system would soon have to be introduced to meet the expected increasing demand for fully qualified staff. At the time the traditional approach to this problem was by way of an indentured apprenticeship, with the apprentice learning his trade under the instruction of a skilled artisan.

In realisation of this need the fledgling electricity undertaking took on its first apprentice on 1 September 1906. In those early days apprentices were not paid for the first year of their service, and very little in subsequent years. They even had to pay an initial fee of £50 to the Council for the privilege of being trained.

Apprentices were also required to further their studies by attending engineering classes in the evening in their own time, initially at the then South African College and later at the Cape Technical College and the Maitland Technical College. Subsequently, in a progressively phased-in process starting in the late 1940s and early 1950s, apprentices were released to attend classes during the day rather than in the evenings. This system was introduced in recognition of the fact that it was not reasonable to expect apprentices, after having spent a full day at the bench, to then attend demanding technical classes in the evenings.

This system was further refined in January 1966 when all technical colleges in the country phased-out day classes in favour of a block-release system. Under this new system apprentices were released for a ten-week period each year to attend full-time day classes at the technical colleges. This period was later expanded in 1972 to a full trimester system of three months.

This most successful block-release system was later extended to include the training of technicians - as opposed to artisans - to a higher level of technical competence than was possible in the past under the very limited and restrictive apprenticeship scheme. Under this new technician system, which was introduced in January 1968, trainees were released to attend technikons full-time for a semester of six months, with the following six months spent on the job; the so-called "sandwich" course.

It was hoped that technicians trained in this manner would ultimately fulfil the long-felt need for staff with sufficient technical training and knowledge to enable them to relieve the professional engineers of many routine and less involved tasks which then occupied a large part of their time. Another aim of this new scheme was to provide training for future power station shift engineers and shift control engineers.

But around this time in the 1960s, a chronic staff shortage was being experienced in the engineering artisan grades. To address this problem and to further improve the quality of training, an Apprentice Training School was established at the Department's workshops complex in Ndabeni and officially opened in January 1972.

A decade later the technical staff shortage had extended even further afield, this time to professional engineers. By the early 1980s the shortage of professional engineers was becoming more acute, and to encourage university undergraduates to take up an engineering career with the Council, employment was offered to students during their vacation periods. At the same time the Council also introduced a bursary scheme, which is still functioning to this day, for students reading for a BSc degree in electrical engineering.

To cater for this increase in the number of trainees the training school was progressively expanded over the years to accommodate an increasing number of different trades, as well as university engineering students. To reflect these changes the school was redesignated as the "Technical Training School" in 1988.

The following year the training programme was further extended when an "Overhead Line School" was opened at the City district depot in Hudson Street to provide more formal training for the district staff. Existing linesmen and faultsmen were retrained in safety procedures applicable to 11 kV overhead lines. Since none of the staff had previously had any formal theoretical training the course was divided into three parts, namely in-field training at the City depot, a series of lectures of a semi-technical nature, and a final theoretical examination. This school proved to be a great success and is still functioning to this day.

Over the ensuing years the existing rather limited accommodation at Ndabeni was progressively stretched to the limit. To accommodate the continuing increase in the number of trades provided for, and the increasing number of apprentices and other students in training, the technical school was moved to far larger leased premises at 37 Berkley Road, Maitland, on 4 October 1994.

The Department has been extremely fortunate in having had right from the outset a highly motivated and dedicated staff responsible for technical training. The high standard consistently maintained by this staff is clearly reflected in the meritorious scholastic achievements of the many apprentices and other students who have passed through their hands over the years. Many students have distinguished themselves with first class passes and the award of numerous academic prizes, such as medals and floating trophies. By way of example, one of the School's apprentices was awarded the coveted Association of Municipal Electricity Undertakings (AMEU) Award for the best municipal electricity department apprentice in 1985.

CENTENARY CELEBRATIONS

100 Years At Your Service

A full one hundred years has now passed since the inauguration of the Graaff Electric Lighting Works on the banks of the Molteno Reservoir in Oranjezicht by the Mayor, Mr George Smart, on the evening of 13 April 1895, an event that also marked the establishment of the City's electricity undertaking. On this auspicious occasion dignitaries and invited guests met first at the new power station to set the generators in motion, and then adjourned to the Town House in Greenmarket Square where the Mayoress later ceremoniously switched on the new street lights for the first time.

To commemorate the centenary of this important milestone on 13 April 1995, it was decided to follow a similar sequence of events, starting at the Molteno Reservoir and finishing at the old Town House. Appropriately, the theme adopted for the centenary celebrations was "100 Years At Your Service".

Molteno Reservoir Proceedings

The proceedings started at 5:30 p.m. in the very same room that originally housed the water turbines and dynamos of the City's first power station, and in which room the inaugural ceremony had taken place precisely one hundred years before to the day. The City Electrical Engineer, Fred Berwyn-Taylor, introduced the guest of honour, Sir De Villiers Graaff, son of the late Hon David Pieter De Villiers Graaff, in whose honour the Electric Lighting Works were named.

In his address Sir De Villiers Graaff referred to the family's early history, and more specifically in the following terms to the pivotal role played by his father in bringing electricity to Cape Town.

> *At 23 David Graaff was elected to the Cape Town City Council and at 32 he was Mayor for two years in 1891/1892. During his period in office as Mayor, he, with the help of his officials, drew up plans for the future development of Cape Town which covered water supply, sewage, lighting and the rationalisation of the city's finances and a series of other improvements. During this period also, he travelled overseas and gave particular attention to the electrification of certain cities in England, the Continent and America and to the drainage problems of those cities. While in London he was presented at the Court of St James, and met Queen Victoria. At The Hague in Holland, he met the Queen Regent and in Berlin, the Kaiser*

Wilhelm. Old newspaper cuttings in the family archives indicate that when interviewed by the Press overseas as to the future plans for Cape Town he referred, not only to water, lighting and drainage, but also a sea-promenade, opening up new streets to the sea front, a new fish market and a new Town House. Thus reported the journal "South Africa" on 19 December 1891.

On the 18 January 1892, the London Times reported that "Mr Graaff, the Mayor of Cape Town, who is on a visit to Germany for the purpose of visiting its municipal institutions, is receiving every attention from the Berlin authorities. The Chief Burgermaster has shown him the principal institutions in the city and has also visited the works at Siemens (Electrical Engineers). He has also examined, in detail, the drainage in Berlin and the system employed for the disposal of sewage". Subsequently he also visited Buenos Aires in the Argentine and studied its electrification schemes.

Sir De Villiers Graaff went on to outline the early development of the City's electricity undertaking and related several anecdotes pertaining to his father, closing with the following observation.

My father certainly lived through times of change. I wonder how he would have viewed the changes we are experiencing here today and what advice he would have given as to the future. I am sure he would have appreciated the fact that the centenary anniversary of the lighting of his beloved City of Cape Town was commemorated and his name associated with it.

Sir De Villiers Graaff then unveiled a commemorative plaque, after which the official party departed for the Town House, where the concluding ceremony was to be held. The plaque, which was later mounted on the wall outside the Molteno building, reads as follows.

THE GRAAFF
ELECTRIC LIGHTING WORKS

ON 13 APRIL 1895 THE MAYOR OF CAPE TOWN, MR GEORGE SMART, INAUGURATED THE CORPORATION OF THE CITY OF CAPE TOWN'S FIRST ELECTRICAL GENERATORS HOUSED IN THIS BUILDING. LATER THAT EVENING AT THE TOWN HOUSE THE MAYORESS SWITCHED ON THE FIRST ELECTRIC STREET LIGHTS IN THE CITY.

To be continued…