

Energy Workbook

ACTIVITIES AND INFORMATION FOR COMMUNITY LEARNING & INVESTIGATING CIRCLES



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& training

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ENERGY AND WATER SECTOR EDUCATION AND TRAINING AUTHORITY

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CONTENTS

Introduction.....	1
ENERGY BASICS WORKBOOK	
What is Electricity?	5
ACTIVITY 1 – Make a Lemon Battery	5
What are volts?.....	6
How many volts are dangerous?	6
Where do 240 volts come from?.....	7
ACTIVITY 2 – Your ‘Lightbulb’ Moment	9
What are Amps?	10
What are Amp-Hours?	10
ACTIVITY 3 – What happens when we overload electric wires?	11
STORY CODES ON ENERGY IN THE COMMUNITY	
Transect walk at Rolihlahla.....	12
Energy and Social Injustice	13
Electricity for Whom?.....	14
Our Experiences of Electricity	15
Getting an electricity connection.....	16
Who is Mr Fix-It?	17
Ntobomxolo’s Family	18
Sanna Hector’s Story	19
The MacGyver	20
Zola’s Story.....	21
Cutting the Electricity Cake	22
PICTURE CODES ON ENERGY ACCESS AND USE	
Group Discussion on picture codes.....	23



INTRODUCTION

This is a workbook for community learning groups. This workbook has stories and activities that can support groups to explore issues around access to energy in working class communities.

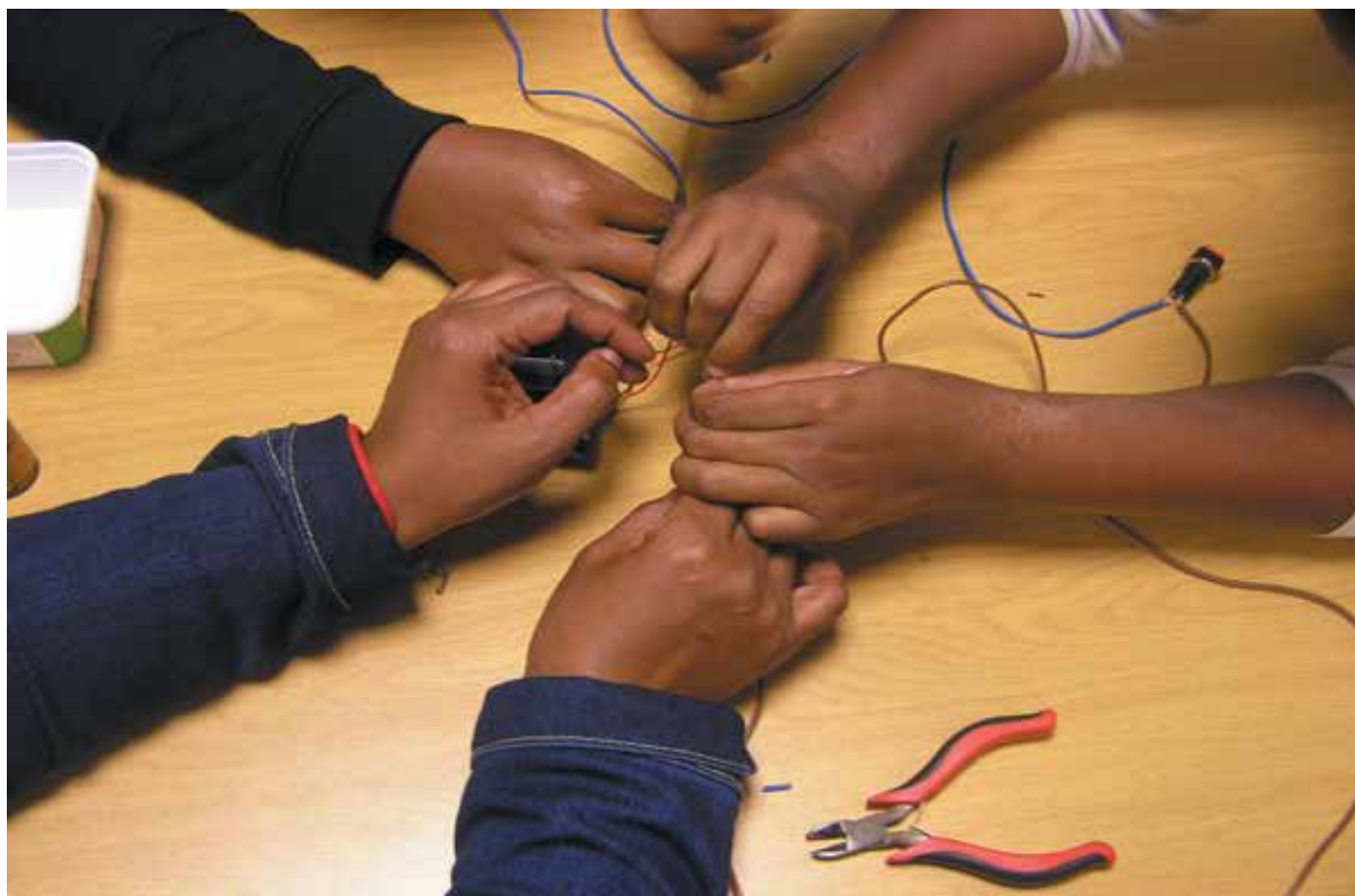
Team members of the Community Education Programme learnt together how energy comes from power stations to households. They practically set up energy circuits to study how energy moves from a power source through a circuit and what happens if too much energy is pushed through wires designed for a low energy load.

Armed with new knowledge and insights, the group walked through local neighbourhoods, took photographs of energy issues that interested them, and spoke with family, neighbours and other community members about their experiences with energy.

They documented their interviews and observations and wrote short pieces that put forward their experiences, views, and sometimes questions.

They organised community education events in the same neighbourhoods from which they learnt and invited all interested community members to attend these events. They shared what they discovered and facilitated discussions amongst community participants. The CEP team made a play that explored the issues lying behind the energy choices individuals and households make. They called it: "Behind the wires". The play ended in a community meeting, and participants at the workshop stopped being the audiences and became part of the play, expressing their views about what could be done.

This workbook is a collection of their energy basics study material, writings and photographs.



Building an electric circuit



Documenting our work and writing together



Reading and sharing our writing



The Community Education Event: Using lemons to make an electricity circuit with community members



The Community Education Event: Building a rocket stove



Behind the wires – the play at the Community Education Event



Participants at the Community Education Event enjoy the play

ENERGY BASICS WORKBOOK

What is Electricity?¹

Electricity is a kind of energy.

Energy makes things work e.g. the energy in petrol makes the taxi move and the energy in food makes our bodies grow.

The energy in electricity helps us do things like: cooking, lights, TV and cell phones.

The problem is that you cannot see electrical energy, you only know it is there when it makes something happen; like when you switch on the light switch.

You can feel electricity if you touch an electric wire at home.

But do not do that because you can get a bad shock, a burn or even die – because electricity at home is high energy (240 volts). It is DANGEROUS!

ACTIVITY 1 – Make a Lemon Battery

You can make SAFE electricity with wires and a lemon. It will not hurt you.

Push one zinc wire and one copper wire into each lemon then connect them like you see in this picture.

It is low energy (0.5 volt) so you can touch the wires on your tongue – and you will taste it!

What do you feel on your tongue?

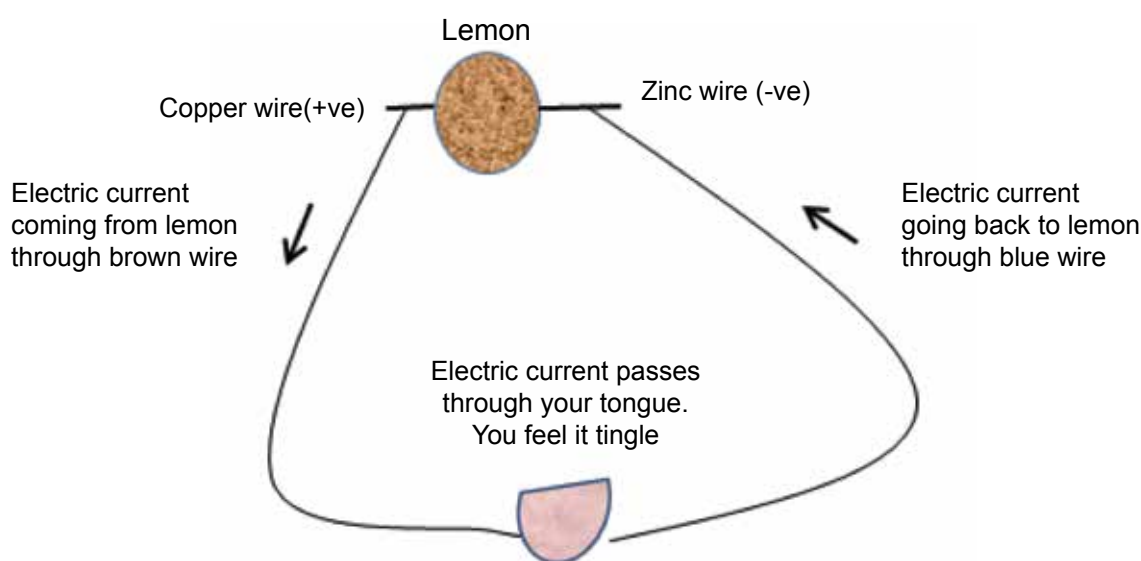
The tingling feeling on your tongue is electrical energy coming from the lemon.

The energy comes up the copper wire, passes through your tongue and goes back to the zinc wire.

We call this an electric CIRCUIT. The flow of electrical energy is an ELECTRIC CURRENT.

The current only flows when all the circuit is connected.

We can draw this lemon circuit like this:



¹The Energy Basics Workbook was written by Neil Murtough with input from the CEP Team

ENERGY BASICS WORKBOOK

The copper wire is where the electric current comes out of the lemon, so we call this the **positive terminal (+ve)**

The zinc wire is where the electric current goes back into the lemon, so we call this the **negative terminal (-ve)**

What are volts?

A lemon battery works the same as a torch battery but it has small energy, it only makes 0.5 volts.

A lemon battery cannot make a torch bulb shine.

But a torch battery has more energy because it makes 1.5 volts. So it can make a torch bulb shine.

Volts mean how much **force** the electricity can push. The more volts you produce, the more work the electricity can do.

Think about volts like pushing a taxi - one person will struggle to push. But five people can push a taxi easily.

Five people can do more work than one person.

How many volts are dangerous?



This torch battery has 2 terminals. Can you see the labels for +ve and -ve? It says 1.5 volts so you know it is safe to touch.



You need 9 volts to work your radio. It is safe to touch.



You need 12 volts to start your car. Do not touch 12 volts because it will burn you.



If you want to work your computer, you need 240 volts. But you must be careful because 240 volts will give you a bad shock or even kill you if your skin is wet, or you have a weak heart.

ENERGY BASICS WORKBOOK

Where do 240 volts come from?

Most things at home need 240 volts. Homes get this supply of energy from Eskom through the **electricity grid**.

The grid is all the wires, pylons and poles that bring volts from a power station to your home.

Look at these pictures and you can see why the grid produces energy volumes that are very dangerous.



This power station changes the energy trapped in coal into electricity. It sends this electricity via large masts (pylons) and high voltage power lines to power substations.



These pylons and power lines can 'push' 132 000, 275 000, 400 000 and 765 000 volts of electricity quickly from the main power station to a local power substation.

Should you accidentally touch these wires, this high voltage will burn you to ashes.



This sub-station in Kwa Magxaki lowers the voltage from the main power lines. These poles and power lines carry 11,000 volts from the sub-station to transformers in factories and neighbourhoods.



These poles and power lines carry 11,000 volts from the sub-station to neighbourhood transformers.

Should you touch a power line like this it will kill you instantly.

ENERGY BASICS WORKBOOK



This sub-station transformer changes 11,000 volts to 240 volts and sends it to even small electricity distribution boxes in streets.



This pole transformer changes 11,000 volts to 240 volts for distribution to households. Carrying electricity above ground on poles and pylons is cheaper than carrying it underground.



This box - 'iDanger' – distributes electricity to households at 220 or 240 volts.

Even these volts can give you a bad shock, burn and even kill you.



A sub-station transformer with unauthorised connections.

A man was burnt to death here connecting 'izinyokanyoka'.

ENERGY BASICS WORKBOOK

ACTIVITY 2 – Your ‘Lightbulb’ Moment

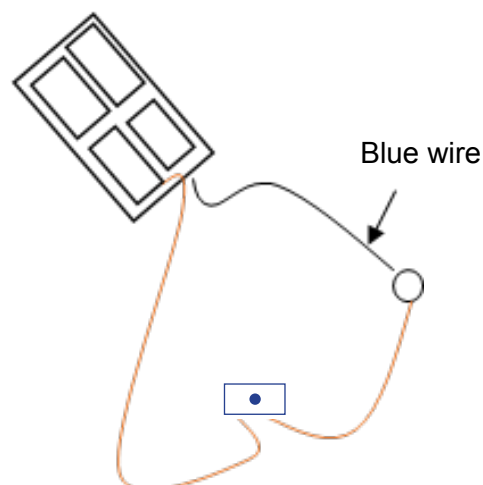
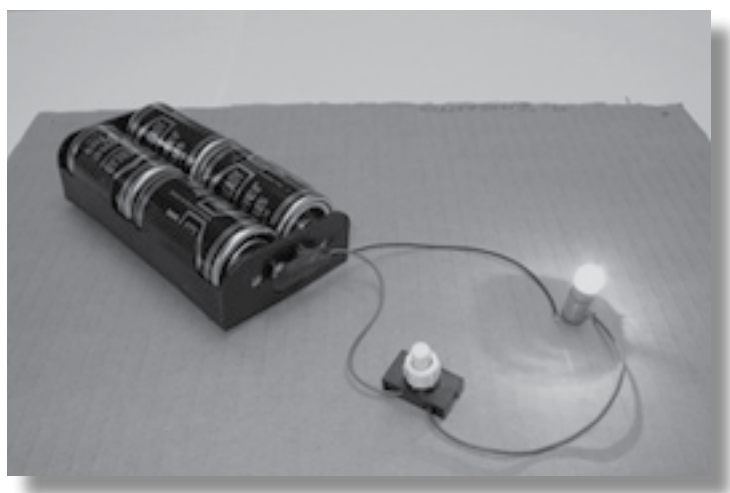
Check you have these things:

- 2 torch batteries
- 1 battery box
- 1 switch
- Blue wire –ve
- Brown wire +ve

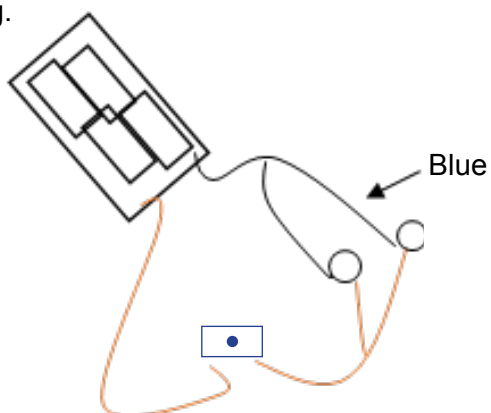
Now make a circuit so that **one** light bulb works and you can switch it **on/off**.

When your circuit works it will look a bit like this picture:

Now your facilitator will help you to use the amp-meter to measure the number of AMPS of electricity that 1 bulb is using.



Next connect another bulb like you see in this drawing and measure how many amps that 2 bulbs are using.



How many amps does 1 bulb use? _____

How many amps do 2 bulbs use? _____

ENERGY BASICS WORKBOOK

What are Amps?

Amps are how we measure the amount of electricity we are using when a machine is working.

For example your kettle uses 4 amps.

Your TV uses only 1 amp.

Which one eats more money?

You may think that your kettle eats more money than your TV because it uses more amps - but maybe not!

What are Amp-Hours?

You need to know about AMP-HOURS because that is what you buy with your electricity card.

The Metro calls them UNITS.

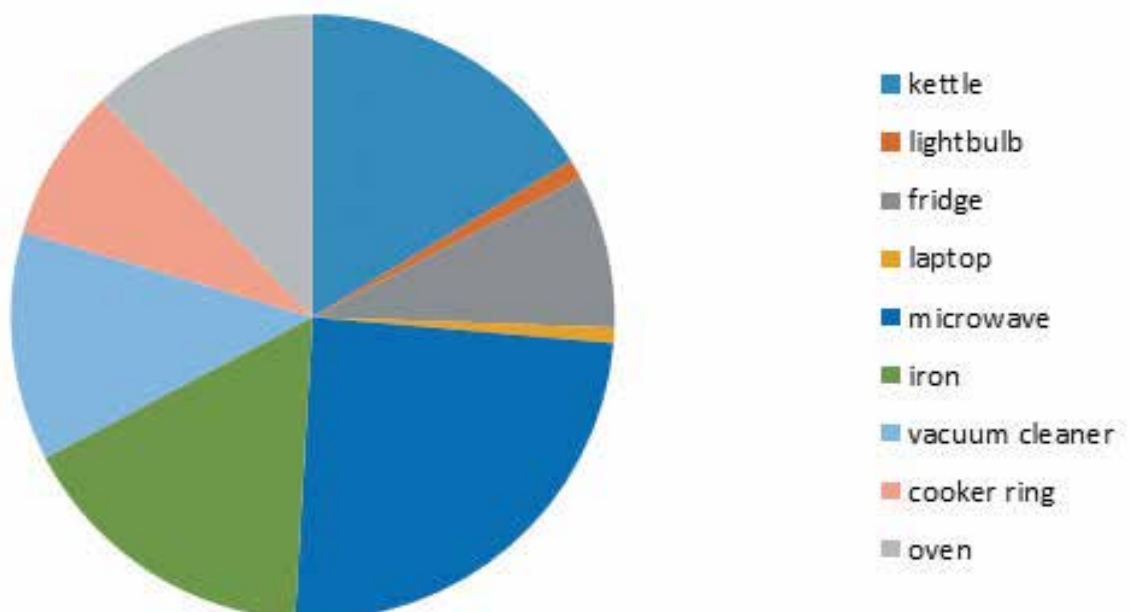
You can calculate the number of amp-hours your appliances use - all you need to do is multiply the amps of the appliance by the hours you use it.

If your TV uses only one amp but it is working for ten hours each day = $1 \text{ amp} \times 10 \text{ hours} = 10 \text{ amp-hours}$.

If your kettle uses four amps but it is only working for two hours each day = $4 \text{ amp} \times 2 \text{ hours} = 8 \text{ amp-hours}$.

So your TV eats more money than your kettle.

amps of appliances at home



ENERGY BASICS WORKBOOK

ACTIVITY 3 – What happens when we overload electric wires?

Now make a circuit with one battery and a switch. Connect your blue and brown wires to the small piece of thin wire.

Feel the small wire, is it warm?

Next use two batteries and then feel the small wire. Is it warm?

Now connect eight batteries to the small wire and hold a piece of polystyrene against it. What happens?

When you push a lot of volts through a thin wire what can happen?

.....

We can say that it is dangerous to use thin wires in your house because these wires can overheat when we connect many appliances. When a wire is carrying electricity beyond its capacity, it is called **overload**. When this happens the heat can start a fire.



STORY CODES ON ELECTRICITY IN THE COMMUNITY

Transect walk at Rolihlahla

Written by Themba Eric Somfula



While we were doing a transect walk at Rholihlahla, we wanted to interview the people there to understand what they think about electricity, but they were afraid to give us information thinking we are seeking to report them to the Municipality. So we explained that we are not impimpis. We were just looking at the conditions that people are staying under because we see the dangers that can affect them.

We saw different people who are struggling with hunger. Some people were feeding themselves from rubbish bags because of the difficulties they are experiencing. They were searching for food to sell so they can maintain their families.

I saw other dangers while we were doing the transect walk. We saw wires that are connecting electricity illegally all over the place. Some are connected up and lying across the road. We saw the dangers adults and children face. They are in danger of dying from electrical shocks from the illegal connections.

I saw that the people did not know how to solve this because of inequality in the communities they are living in. What I wish for is the government to change the situation that the people are living under.

Group Discussion

- Why might community members feel concerned about talking publicly about their problems with access to electricity?
- What pushes households to make unauthorized connections?
- What is your view about electricity connections that were not made by the municipality?
- Are the problems of access to electricity separate from other social and economic problems faced by community members?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Energy and Social Injustice

Written by Vusumzi Meta



Mlungiseleli lives in Chris Hani since 1993 after moving here from the Transkei. Here at Chris Hani people are closer to industry and jobs where they hope to secure work.

In Chris Hani there are no proper basic services, people use the bucket system which is collected fortnightly, people are still using street taps for water and there is no electricity supplied by the municipality.

“If the government can give us, the people of Chris Hani, flushing toilets and rubbish collection every week” that is what Mlungiseleli and members of the community wish for.

One common thing in Chris Hani is the use of izinyoka - illegal electricity connections. As Chris Hani is on a dumping site it cannot be upgraded and so there is no legal electricity – people are using illegal connections from the ‘Danger’ (transformer). The illegal connections are very dangerous for shack dwellers, children and surrounding communities because too many connections will cause the transformer to explode.

I can see there is a relationship between lack of basic services and lack of access to electricity. The struggle is now for basic human rights. These human rights extend to housing, electricity, water and sanitation.

Group Discussion

- Vusumzi argues that not having access to basic services is part of the struggle for human rights. What are your views?
- Does someone like Mlungiseleli have protection of his basic rights under our Constitution?
- How can communities who might live in areas that are not safe for housing (such as old dump sites or along flood plains) organise for access to housing, electricity, water and sanitation?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Electricity for Whom?

Written by Xola Peyi and Siphokazi Matsolo



Xola remembers growing up in a disadvantaged location, “We were using candles and paraffin prima stoves or cooking outside the house when we didn’t have money to buy paraffin. We knew electricity was for rich families and white people.

There were lights in town but there was no electricity in our area. When we asked our parents about those lights we saw in town and how they work, they would say its electricity and electricity is dangerous.”

Siphokazi grew up in KwaZakhele. “We did not have electricity, few houses had it. It was those who had working family members who could afford it. At that time, for people living in KwaZakhele, it was a luxury to have electricity. Years later electricity was introduced to everyone. At first we used it for lights because we did not have many appliances and we did not spend much money. Now it is prepaid electricity.”

Group Discussion

Xola and Siphokazi talk about differences in access to electricity and other resources.

- Siphokazi says electricity is not a luxury any more. Do you agree with her view? Explain why.
- Xola talks about ‘lights in town’ but “no electricity in our area’. Apartheid divided our towns and cities spatially into areas with resources and areas with no or little resources. Have things changed since then? Why do you think this?
- Xola also talks about how race and class in apartheid days ensured some have resources and others don’t. Have things changed since then? Why do think this?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Our Experiences of Electricity

Written by Ntombekhaya Jele and Sima Mtandana



Ntombekhaya grew up in Veeplaas, “At that time we were using a primus stove, paraffin light and imbawula. I knew nothing about electricity until we moved to Zwide. It was the first time we used electricity. My mother taught us how to switch on the TV, the lights, the electric kettle, and stove. But when there was lightening outside, she said we had to cover the mirrors, stop cooking and switch off the TV. Once the TV was burnt out by the lightening.”

Sima did not have electricity at home when she was growing up, but remembers “When I visited my grandmother at work, I would see the lights come out of the ceiling. She used to press this button on the wall and the lights would come on so bright. I was fascinated by these lights. When granny went to another room, I would go there and press the button just like she did. Then she would shout at me saying: ‘**Hayi wena! sukudlala ngento zabelungu!**’. As I grew up I began to think only rich white people can have electricity because not all areas in the location had electricity.

What I know now about electricity is that we cannot survive without it, especially those of us in the urban areas with our technology. It is a need that is rising beyond anyone’s control because, in a way, electricity makes life a little easier.”

Group Discussion

- Ntombekhaya says that her mother taught them about electricity. Do we need to learn how to use electricity? Explain your view to the group.
- If you say yes, who do you think should teach us about electricity and why do you hold this view?
- Why do you think Sima’s grandmother saw electricity as “ngento zabelungu”?
- Can we survive today without electricity?
- Is electricity more important in urban than rural areas?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Getting an electricity connection

Written by Michael Ndesi



I was born in New Brighton in 1983. At my home there was no electricity. It was in about 1993 that Eskom came to my home and fixed up the electricity connection. We were so happy and surprised simply because we had never had electricity and had been using glass paraffin lamps and wood for cooking.

After that day my grandmother became so strict about the electricity because those people from Eskom had given her instructions about using electricity. They told her how dangerous it is and that the children should not touch anything especially when there is water to prevent 'choking' (electrocution) that can cause death.

At 18 years, I went to Soweto-on-Sea to live with my mother and I noticed something there - she was using an illegal connection. I heard my neighbours talking about how bad it is to use illegal electricity. They worried that people from the municipality would find out and that those people using illegal connections would lose their houses or pay a lot of money as a fine.

Group Discussion

- Is it 'fair' to those who pay for electricity when some people make unauthorised connections?
- Why do people hold different views about how to access electricity?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Who is Mr Fix-It?

Written by Vusumzi Metai



Our society managed to have a smooth transition from apartheid to a constitutional democracy in 1994. But in the 22 years of democracy our communities still experience social inequalities which continue to divide and isolate people. This is experienced by Thamsanqa. His story is common in South African townships.

Thamsanqa is a young man who has been living in Chris Hani informal settlement for 22 years, with no electricity sanitation, water or means to make a livelihood. Thamsanqa also feels the need to make means to survive. He sees everyone around him making plans to make a living.

Thamsanqa is a 'drop-out' from school. There were many challenges he had to face in his home. As a result of unemployment in at home, he became Mr Fix-it; making illegal connections in order to survive.

Electricity has affected the relations between people living in the same area. RDP houses can make a livelihood from illegal connections to the shacks. And struggling young people can make a living.

Group Discussion

- Unemployment amongst young South Africans is extremely high. Many unemployed young people have been pushed out of the education system as well. What should be done to support young women and men in Thamsanqa's position?
- Do you agree with Vusumzi's view that access to "Electricity has affected the relations between people living in the same area." Explain your views on this matter?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Ntobomxolo's Family

Written by Qaqamba Lamana



Ntomboxolo Lukwe lives in Rolihlahla in a 2 room shack with her 3 children and her husband. He is employed but doesn't earn enough for them to buy a house, so they've been waiting for many years for the government to build them a house.

The shack she lives in is amongst many others, they don't have electricity so they rent it from a house opposite them for R250 per month. The street in front of her house is filled with many electricity wires that run above people's heads. She says many people have died on that street due to the izinyoka. Many times they have asked the municipality to provide them with temporary electricity boxes, so they can have a legal connection, but they are still waiting.

Although she faces many challenges she is still full of laughter and remains loving towards her neighbours. She still dreams of a better life for her and her beautiful family.

Group Discussion

- When people have waited a long time for government to keep its promises of service delivery, what options do they have to claim their rights?
- What might be the difficulties of government to meet needs?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Sanna Hector's Story

Written by Andiswa Matiwane



Sanna Hector stays in Rholihlahla and she is not using illegal connections, she stays in an RDP house.

She says that some people are using illegal connections simply because they are unemployed and some have children who they have to look after.

Some people are in danger and others are being killed by the electrical wires. "Electricity is very dangerous here in Rholihlahla. There was a house that burned down three months ago due to an illegal connection. These connections will only bring death in this community."

Many people are poor and they are paying a lot of money – R200 per month - to the people who live in RDP houses, and who make a living from the illegal connections that they are doing. Sometimes there are up to 20 connections from one RDP house.

People beg for houses so that they can live better lives like others, so that they can be equal, all together.

Group Discussion

- Does access to electricity make women's lives easier? Tell your group members why you hold this view.
- Unauthorised electricity connections can be dangerous. What are the dangers?
- Nelson Mandela Bay Municipality loses more than R93 million per year as a result of people who use electricity and does not pay. What are your views about this issue.

STORY CODES ON ELECTRICITY IN THE COMMUNITY

The MacGyver

Written by Nomvula Kato and Xola Masele



In Govan Mbeki there are two guys who are unemployed, as a result they do not have money to buy electricity. They decided to put a needle in the electricity box in order to survive. In the box the electricity is at zero even though the electricity is running.

They have a MacGyver stove and iron. The iron has no handle, and they take the wires of the iron and connect them in the box, until the iron gets warm. When the iron is warm they take the wires out of the box and continue ironing.

In most of the areas in Govan Mbeki wires are crossed up from house to house, this is dangerous for people. Cables are lying on the ground which is dangerous for kids and for everyone when it rains.

People are using illegal connections, because the unemployment rate is so high and there is poor service delivery in their community.

Group Discussion

- Do all community members, young and old, male and female, with or without unauthorised connections face the same level of danger from unauthorised access or 'MacGyver' solutions?
- Are "MacGyver" solutions examples of clever problem solving, or are they simply dangerous solutions?

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Zola's Story

Written by Siwa Masiwa



Zola lives in an informal house in Rolihlahla. He connects electricity from an RDP house that is far from his shack. He pays R200 a month to the owner of the house where he connects electricity. There are 3 other families from the shacks that also connect to electricity from the same house. He said the money is given to the owner and she is the one who buys the electricity. He said sometimes the owner buys only R100 of electricity and takes the other half for her needs.

The wires are connected from the house via the poles that are erected next to their shacks. They can't put them under the ground because when it rains the wires are being damaged by rain and the electricity switches off and there will be no electricity for those using these wires.

Sometimes when he does not have money to pay for electricity. He uses a gas stove. He said he can't wait to get his own RDP house and his own electricity, because the R200 he pays would last longer if it was only used by his family. They use electricity to watch television and for cooking and bathing.

Zola has been lucky. Since he started using an illegal connection 2 years ago it has not caused anything dangerous to happen.

Group Discussion

- Are RDP home owners who sell access to electricity to other households who live informally, exploiting these households? Explain your views to the group.
- What stops many people from using energy sources like gas?
- What alternatives do we have to energy sources based on energy from coal? Are these viable energy sources in working class communities? Explain your views to the group.

STORY CODES ON ELECTRICITY IN THE COMMUNITY

Cutting the Electricity Cake

Written by Mzimkhulu Keye



drawing by Mzimkulu Keye

Multi-national corporations use the most electricity. They use electricity 24 hours non-stop to produce goods and maximise profit for the capitalist class. Communities do not benefit from these profits. Company profits goes to the investors and their shareholders and not to new jobs. Government should have taxed them for their high usage of energy, instead they offer the subsidy on electricity costs.

Households all pay the same for electricity. But, middle class people work and have decent houses. They can pay for electricity for many different appliances.

People need RDP houses to get access to electricity. Energy costs for working class people make up a big part of their living costs. The government helps people who are unemployed with the cost of a small amount of energy – this is often not enough. Working class people who live in informal houses make means to join the modern age when they connect illegally.

Group Discussion

- Mzimkulu says: “Government should have taxed [companies] for their high usage of energy, instead they offer the subsidy on electricity costs.”
What are your views?
- Do all South Africans carry the same burden when it comes to the cost of electricity?
What are your views?

PICTURE CODES ON ENERGY ACCESS AND USE

Group Discussion on picture codes

Give each person in the group one or two of these pictures. Ask each participant to:

- Describe in rich detail what s/he sees.
- What are her/his views about what s/he sees?

Discuss as a group

- What are the options for changing the situation that are good for the environment and for people?
 - What can individuals do?
 - What can households do?
 - What can organised community groups do?
 - What can organised workers do?
 - What can political organisations do?
 - What can local and national government do?
- What new knowledge might be useful in addressing concerns the group identified



PICTURE CODES ON ENERGY ACCESS AND USE



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