Making a difference

Reflections on the first ten years of the Energy and Development Research Centre at the University of Cape Town

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This paper does not necessarily reflect the views of the Energy and Development Research Centre

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Contents

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INTRODUCTION

"What I propose therefore, is very simple: it is nothing more than to think what we are doing"
— Hannah Arendt, The Human Condition

This paper is an attempt to trace the development of the Energy and Development Research Centre (EDRC) at the University of Cape Town from its roots about 17 years ago to its founding in 1989, to the present. It is not an official or final history of the EDRC; rather it is the beginning of a historical reflection. Beginning a process of historical reflection about an organisation such as the EDRC poses unique problems of historiography; as Clive van Horen[1] commented:

> "What the EDRC has always been about is a number of different stories. That's why there always is some tension in it; all these stories talking to each other and they don't always agree" (Interview with Clive van Horen)

This is not unusual. Most organisations harbour people with differing opinions and different memories of the facts, but in the EDRC's case, this is made more difficult by the fact that it is as an historical entity unprecedented; research centres are not new, but the EDRC's evolution, in common with many other organisations in South Africa, has gone beyond the bounds of tradition. New territory has been charted, which simply means that it is very difficult to make judgements. Part of this uniqueness is historical; due to where the EDRC is situated, in South Africa, where events of the last decade or so have surprised the world, and created a political environment without useful precedents. The other part is peculiar to the EDRC, which has grown into the organisation it is now by a unique combination of insight, vision and openness, first driven by its founder and director, Anton Eberhard, and increasingly by others. The processes by which this took place were frequently difficult (as most organisations have found in South Africa in the 1990s), but in retrospect, the story demonstrates an unusual willingness to deal with the fundamental issues.

What are the fundamental issues? When the EDRC was founded, Eberhard recalls that "we wanted to make a difference". He saw this happening through the application of knowledge (in the first instance engineering knowledge) to social problems, and, probably without thinking too much about the ramifications that concern us now, looking back, started a process of research and advocacy that became a research centre. This initial impulse has really informed the thinking of people who have worked in the EDRC since; most have wanted to "make a difference". The central challenge that the EDRC has had to face is to be able at the same time to combine an acute sense of political strategy, to keep the organisation 'near the fire', close to where research will be effective, i.e. the political sphere, and at the same time, produce excellent research which utilises to the maximum extent the intellectual resources of its researchers and the university environment which the Centre inhabits. This task goes beyond the vision of one person, especially in a society as diverse and historically divided as South Africa, and so the EDRC has had to work out complicated ways to accommodate diversity in productive ways. This diversity is intellectual – different interests, academic backgrounds, worldviews – as well as social – different genders, races/cultures – and at times political – different relationships with the political process. These differences have had to be accommodated, via the creation of a supportive

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1 Van Horen was centrally involved in the EDRC for a number of years, first as a research and programme leader, and finally as Deputy Director.

organisational environment, as well as articulated, that is, strategically combined to the best effect, which is the task of effective leadership. It is these processes of accommodation and articulation which seem to me to be the central feature of the EDRC's historical development.

This conviction arises from a basic question that arises when one contemplates writing about an organisation such as the EDRC: what *is* it?

This question can better be phrased: what is it that the EDRC does? One answer is research, but this in itself is a small part of the story. Research is a process of making sense of data, and communicating this sense, and is usually so bound up in the context in which it is done, that it is difficult to think about the activity in and of itself. But if we consider research in isolation as a reasoned process of thought, is a timeless activity; it is basically an inner activity. There is no story to it, and thus no history, unless its significance emerges by being placed in a context.

Thus it can be seen that doing energy policy research is significant – it shows a certain political conviction (especially in the late 80s), and might improve the lives of a group of people; but in this context, research is a *means* to an action[2]. Only when the *mere activity* of research is significant, not its outcome (e.g. one could challenge the apartheid government merely by doing research on liquid fuels before 1993, as this was explicitly outlawed), can one say that it constitutes an action in itself. That this is a source of some anxiety to policy researchers; a constant concern that research is "useful", that it will have some political significance, some meaning, illustrates the point nicely. From a historical point of view, this in itself, that is, the activity of doing research, is not really of interest; even outstanding intellectual histories seek to place the development of thought in a social context, to show how it is embedded in other history. While over time, one could probably show a logical development in the result of research in and of itself, this is not a *historical* development. What is of interest is the *decision* to do the research, and what one brings to it, and how it changes the researcher. In a sense I am claiming that one of the EDRC's central activities in itself is not worthy of a history. This is true.

This is not the case with the actual social context of the research itself. This context is what I will call an *intellectual space*. In this context, research is also a *communicative activity*. This is a space which sustains and reproduces intellectual activity, which in retrospect is what the EDRC project amounts to. Intellectual spaces most familiar to us, universities, have their conditions of existence entrenched in our culture, and so in a sense these are invisible to us. It is interesting that globally, these conditions are increasingly under pressure, so the history of the EDRC comes at a point where universities are having to face more and more basic questions. This is of interest here because the EDRC's history is really a history of charting a new form of intellectual space. The lessons for the broader intellectual community of the EDRC's experience was not lost on its Director, who published a paper on this topic in *Social Dynamics* (23.1 (1997)). The dilemma for him was the relationship between contract research and broader intellectual activity, or, put another way, how to sustain intellectual activity and reproduce it. This is the key characteristic of an intellectual space. It must be able to sustain the activity of thought above the subsistence level. Pure contract research (consultancy) does not do this. There, the researcher's time is wholly sold as a commodity to the client. Anything else, debate between researchers, teaching, mentoring new researchers, is the beginning of an intellectual space. Unlike a university, however, the EDRC did not come into the world fully-formed; it was, to paraphrase E.P. Thompson, present at its own birth, which is to say that the precise way in which the EDRC evolved was a political process, an indeterminate,

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2 One can seen this grammatically and logically; "John improved the lives of the people of x by researching y" – The action is "improved" – "researching" is in the subjunctive.

public and creative interaction between different people, and this process is eminently worthy of a history.

We can elaborate on this a little further by looking at the relationship between this intellectual space and the energy sector in South Africa. I will use a metaphor of three overlapping spheres to explore this relationship. The first is the intellectual sphere, where intellectual activity takes place, and the governing principle here is truth[3]: the central aim of intellectual activity is to find ways of determining what is true and what is not. The second is the public sphere, where different truths are compared and evaluated, meanings are created and dissolved, and processes are undergone to choose and promote publicly acceptable values and truths, and the governing principle is legitimacy: the aim of activity in the public sphere is to ensure legitimacy by public agreement based on the public use of reason. The third is the political sphere, where interaction is strategic rather than taking the form of a dialogue, and the ruling principle is power. This is a simple metaphor for government, which requires truth, legitimacy and power to function properly; in other words the intersection of these three spheres. Policy is similar; policy required good research, widespread consensus amongst stakeholders, and political ownership. It is thus necessary to engage with all three spheres creatively to be an effective policy research organisation, to 'make a difference'.

There are different ways of doing this, which have evolved in different contexts. For instance, 'policy science' in the US in the 50s stressed the apolitical nature of policy research, limiting the activity of policy researchers to the intellectual sphere (this was partly based on false assumptions about the policy process as a whole). Others have evolved other models. The aim of this historical reflection is to see which ways have evolved in the EDRC of relating to the three spheres, what syntheses of intellectual, public and political activity have evolved in this intellectual space.

How can the story be told in such a way that it will in fact shed light on this process? The history has several other tasks, which are sometimes difficult to reconcile. It must tell the story of the development of the EDRC, paying attention to more important parts and neglecting less; it must record the contribution of each participant impartially, and it must also convey the substance of what the EDRC did (the research) and place this in a context which shows its significance. The approach I have chosen performs some of these tasks better than others. Initially, I conceived, with the help of the EDRC's director Anton Eberhard (who probably has the longest view of the EDRC's history, with all the advantages and disadvantages that this brings) of a series of 'phases' or 'stages' of development, periods of time. While this was broadly effective, it obscured some very important facts about the EDRC. For instance, whereas the period from about 1991 to 1994 could be termed the 'EPRET[4] era', there was very significant continuation of RAPS[5] research during this period, which was a manifestation of the 'alternative technology' era. Instead, I looked at the possibility of using the evolution of the Centre's structure as a framework, but this again seemed to obscure important facets of the history. Researchers seemed to work across research programmes regularly, and the programmes themselves seemed to be rough approximations of what the researchers inside them did.

Finally I decided to look at what researchers were doing in terms of the point of intersection between research and the world; with what worldview they undertook their research, what the structure of means and ends was, and what the implicit

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3 I mean here "truth" with a small "t", an everyday notion, not "Truth", which has grander metaphysical pretensions.

4 EPRET is an acronym for the South African Energy Policy Research and Training project, a policy research project undertaken by the EDRC from 1992 to 1994.

5 Remote Area Power Supply research, usually involving off-grid solar electrification.

intellectual culture was that informed research. This approach was informed by a notion of culture, both organisational and intellectual, as a way of doing things, but also as a resource to draw on in an organisation. (I was partly inspired to think in this direction by Mongameli Mehlwana, who described a similar idea he had used in his anthropology research.) I have thus devised six categories. In a sense these are roughly chronological; they arrive at the EDRC in order, but they do not disperse in the same way. They could be called a number of things, 'eras', moments', 'aspects', phases' and so forth, but I could not think of a word that captured their historical existence as well as their importance as attribute, as description. 'Wave' is the closest concept to the meaning I have in mind. Like a wave, they break over the EDRC with a certain momentum, leaving some things changed, and recede over an undefined period. Sometimes only traces remain; sometimes for years, and like a wave breaking into a tidal pool, it is not always clear when a specific handful of water arrived. Mark Davis suggested the term 'mode', which is an improvement on 'wave' in some respects (less dramatic), but does not capture the historical nature of these developments as well.

The categories are as follows:

Technical – the aim is to make a difference by careful analysis of the problem, and devise a solution. This approach encompasses the early period in the ERI, both the activities of collecting data and the activity of technical innovation, and it extends to 1998, when the last traces of the RAPS programme were completed. It leaves very strong traces in the organisation, particularly in CAREDA (the Co-operative Assistance for Rural Energy and Development in Africa programme), but also in other places. The primary skill is technical; engineering, or skills associated with quantitative surveys, combined with other skills such as an in-depth knowledge of the development environment.

Policy/political – the aim is to make a difference by influencing agendas, creating webs of political contacts; doing and placing research in response to this process. This approach begins in earnest with the ANC Electrification Conference, continues through EPRET to the formal support to the Parliamentary Portfolio Committee (PPC), the Minister and the Department of Minerals and Energy (DME) and the Energy, Efficiency and Environment (EEE) programme's support of the Climate Change policy process, and the informal networking that is central to a lot of the EDRC's work. The primary skill is to be able to think in terms of political strategy and to have a well-informed sense of process.

Social – the aim is to make a difference by aiming to critically reflect on and modify social interactions. The social emphasis is mainly concerned with meaning; with seeing the meaning of specific practices as part of people's lives. This approach includes much of the activity of the Women's Energy Group and the Social Determinants project. I have also included CAREDA and the Rural Electrification project, as these projects/programmes seemed to have an emphasis on process, and engaged on a social level, even though the fit is not exact. The skills characteristic of this approach are social science skills; participant observation, an understanding of social processes and non-technical problems stemming from technology use and change.

Efficiency/Environmental – the aim is to make a difference through a concern with a complex web of interactions spreading beyond an immediate practice; both these concerns inform policy options in a new and powerful way; revealing these interactions opens up a range of creative policy alternatives not available to an orthodox analysis.

Governance/Institutional – the aim is make a difference by looking critically at the structure of organisations (e.g. electricity utilities) and institutions (e.g. the electricity market) and how they are governed, and in some cases to engage with organisations/institutions, or to make policy recommendations to effect change. This includes work on the electricity sector and other sectors, and most of the work

of the Energy, Markets and Governance programme, as well as a lot of the work of the EEE programme on climate change and mitigation. The primary skill is economics, but other forms of policy research are equally influential.

Organisational – this is in a category of its own. Organisational activity is aimed at creating an environment which is conducive to fulfilling and high-quality work, which is an enormous challenge in South Africa, and the way in which the EDRC has attempted to do this is an interesting aspect of this history. I have attempted to show how integrated this aspect of the EDRC is with its research activity.

These categories are not definitive; I'm sure that there is probably a better scheme that could be arrived at with more reflection, and not everything fits precisely. Wide-ranging researchers like Mark Davis defy easy categorisation. To borrow from Wittgenstein, the categories are set up:

> "..as *objects of comparison* which are meant to throw light on the [history of the EDRC] by way not only of similarities, but also of dissimilarities.." (from Wittgenstein's *Philosophical Investigations*).

I have used these categories as section headings, which means that the history itself does not read chronologically; it jumps backwards and forwards in time. It is also perhaps a little confusing to really get a sense of the structure of the organisation because of this; for this reason I have tried to be explicit about the evolution of research programmes and formal structure in the 'Organisational' section.

What will be hopefully be revealed by structuring the history in this way is the evolution of the relationship between the EDRC and the policy process. This approach has certain disadvantages: it places more emphasis on research and advocacy, and less on organisational issues and the crucial role of non-research staff in the EDRC, which is significantly underrepresented here; a proper representation of these aspects of the EDRC will have to wait for a more comprehensive official history. This bias in my approach is also influenced by my research focus of my thesis, which is the policy process. I have tried to make the history as comprehensive as possible, but this is essentially an oral history, having been compiled primarily from interviews, and as such is not comprehensive; the process of gathering information in this way was not very systematic, and often depended on random factors, such as which present and past researchers were in Cape Town. If I have left anyone out, or emphasised their contribution less, I do not wish to imply in any way that their work was insignificant to the development of the EDRC.

I have provided a glossary at the end of the paper for those not familiar with the South African energy sector, which is riddled with acronyms.

BACKGROUND

• International

Energy first entered the political vocabulary of the world in its own right in the early to mid 70s in the wake of the oil crisis. A concern with "energy policy" arose amongst the wealthy countries of the world, and the rest followed. In response to the crisis, the OECD countries formed the International Energy Agency (IEA) to promote energy security amongst member states. Before this, energy was seen as cheap and abundant and essentially infinite, subject to technological innovation. There seemed no reason in principle why energy consumption should not keep on growing *ad infinitum*. Energy policy went by other names, such as industrial policy, minerals policy, commodities policy, military policy, or foreign policy.

This new-found interest in energy as a sphere of government intervention focused on energy security: the main aims of energy policy in the 70s were to guarantee the uninterrupted supply of energy, specifically oil, which had unexpectedly become vulnerable to unpredictable geopolitical disturbances after the 1973 Arab-Israeli War; colonial and neo-colonial patterns of resource exploitation were suddenly thrown into disarray. It was assumed then with a certain vehemence that economic output was directly proportional to energy consumption, and thus that continued economic growth was dependent on continued growth in energy consumption; therefore the prime problem to which government had to attend was one of supply. This was primarily conceived of as a technical and geopolitical problem, requiring adequate institutional response from government in the form of oil reserves, investment in 'promising' technologies such as nuclear fusion, interference in Middle Eastern politics and involvement, directly or indirectly in the odd war in the Gulf. Gradually, however, this supply-side emphasis began to come under attack. From the 70s economists in think-tanks such as the Club of Rome began to speculate on the consequences of finite resources such as fossil fuels running out, combined with Malthusian speculation about the number of people that the earth's resources could support, given unending economic growth. Added to this was a growing suspicion amongst some energy policy analysts that economic growth might not be tied to increasing energy consumption. The new concept here was energy efficiency; it seemed as if it might actually be cheaper to invest in energy-efficient technology than to build new power plants. This was given further impetus by two developments. The first was the growing realisation by scientists that carbon dioxide emissions, mainly from the burning of fossil fuels, were global warming, which could have catastrophic consequences in the future, and the second was the development of the global economy and the privatisation of many state-owned parts of the energy industry, such as electricity utilities, which led to a renewed interest in energy efficiency, for economic reasons These developments sparked an interest amongst energy policy analysts and economists in looking at the end-uses of energy more carefully, and turned the notion of planning in the energy sector on its head. The demand side was now just as important as the supply side. The effect of these changes on the energy sectors of many countries was significant. Privatisation and deregulation, or the setting up of regulators to create markets out of apparent natural monopolies, was to create much more complex industries requiring much more complex policy and a much higher degree of efficiency.

• The South African situation

By contrast, energy policy in South Africa at the end of the 80s was informed by the same assumptions that had driven energy policy of OECD countries in the 70s, only more so. There were two layers to apartheid energy policy, namely development and security. A development-oriented industrialisation programme

aimed at exploiting South Africa's huge coal reserves had established Eskom and Sasol and an embryonic, but very expensive, nuclear power programme by the beginning of the 70s. By the time the oil crisis struck and Arab markets were ostensibly closed to South African purchasers, the South African government had already felt it necessary to set up a secret strategic oil fund. The crisis caused a panicking government to order the construction of Sasol 2 and to constitute an Energy Policy Committee to establish an 'integrated' energy policy. The deliberations of this committee, and the making of energy policy generally, were not widely shared with the public, who, particularly after the late 70s, risked criminal prosecution for speculating about either nuclear or liquid fuels policy, or a range of other energy-related issues. The complex politics of the energy sector, which ultimately affected all the millions of official and unofficial South Africans at the time, were limited to a handful of politicians, industrialists, scientists and academics, all white and male, and mostly with security clearances. Some major energy policy decisions, particularly those involving nuclear expenditure (which involved billions of rands) were not even discussed by the Cabinet. Energy policy during the 70s and the 80s was as a result non-responsive to the needs of the majority of the population, or really even the needs of the apartheid state. Non-transparent processes and an unwillingness by government to engage with crucial policy issues led to the squandering of billions, even in terms of the apartheid government's own narrow policy goals. Big parastatals in the energy sector were immune to criticism – it required a judicial commission of inquiry to stop Eskom from continuing with a mostly unnecessary capital-expenditure programme that was so large that it threatened to destabilise foreign exchange markets in the mid 80s (the irony was that none of this money was going to be spent connecting the majority of South African households who were without electricity at the time, to the grid).

In 1980, PW Botha ordered a major restructuring of the state bureaucracy. The enhanced importance of energy security issues following the second oil crisis, which saw South Africa's remaining ally in the Middle East, the Shah of Iran, fall from power, led to the creation of the Department of Mineral and Energy Affairs and a unification of energy policy and governance functions, which had previously been spread out over four departments and a few other government agencies. This in turn led to the realisation amongst senior bureaucrats that the Department had no policy-making capacity to speak of and a barely functional regulatory capacity wholly occupied with the application of a secretive and confusing web of regulations covering strategic energy resources. The outcome was that a National Energy Council (NEC), funded by sector-specific levies, was established, which reported outside the normal civil service structures. While this caused political isolation and probably rendered the Council's enhanced policymaking capacity less effective than it might have been, it allowed a certain degree of space unusual within the apartheid state. While the regulatory divisions of the National Energy Council were still prosecuting an energy policy identical with the aims of the apartheid state, some parts of the policy and research arm were harbouring tendencies which were more forward-looking.

Johan Basson, a scientist with the CSIR, and later head of the Energy Branch of the reconstituted DME, describes a growing interest amongst researchers in energy issues outside of the apartheid canon. In the early 80s, when PFP MPs were mocked and fulminated against for raising questions in the House about diminishing fuelwood in Natal, these were marginal issues for apartheid planners, but by 1987, government researchers were presenting material on rural energy use to the Minister. He didn't understand what they were getting at; apparently he queried an equally puzzled Director General about the relevance of wood supply to energy policy, being firmly of the impression that it was the domain of the Forestry Department. Nevertheless, these developments, coupled with increasing misgivings about apartheid amongst some bureaucrats, created a small space for

research on what was referred to (in typical apolitical fashion) as 'appropriate technology'. This was made more apparent by the failure of apartheid policy in so-called 'homelands' and 'independent states', and the capitulation of the government in the 80s on influx control, meaning that millions of black South Africans were for the first time regarded by official planners as a permanent feature of the urban landscape. At the same time, the apartheid-inspired Regional Service Councils had largely collapsed, both financially and politically, and service provision was regarded as a political priority. The response of the energy bureaucracy to this situation was curious. It gradually dawned on them, as apartheid plunged further into crisis, that most of the country was without access to decent energy services. This process is reflected in the Annual Reports of the Department of Mineral and Energy Affairs during the 80s. The 1983 report contains no mention of energy provision for low-income households or even a research programme to explore such an initiative. The 1984 Report contains a reference, under the National Programme for Energy Research entry, to a test done on solar water heaters for low-income houses. Nothing came of this. The 1985 Report contains nothing. The 1986 Report contains a small sub-heading, again in the National Programme for Energy Research; under 'alternative technology', there is a sub-heading for 'appropriate technology', and a list of projects, which correspond to the projects being carried out by Anton Eberhard in the Energy Research Institute (see below). The next year (this time under the auspices of the National Energy Council), in the same place, the heading is replaced with 'Energy for Developing Areas'. Up to now, the field of 'alternative technology' had been dominated by technical research, associated with alternative supply options. However, in the NEC report of 1987/88, for the first time a definitive reference to low-income households appears:

> "The current situation is such that although the countries of Southern Africa are richly endowed with energy resources, the supply of affordable energy in an appropriate form to the majority of the developing sectors of the population remains a major challenge.."

From here on the pattern is set. "Developing sectors of the population" is a code for black, and the "developing areas" are rural areas, particularly those areas classified "homelands" under apartheid. Renewable energy is regarded as the appropriate solution, even though more than half of the energy-deprived "developing sectors" were within easy reach of the grid. This is how the energy problem was confined, by being defined as a rural and technical problem. Urban and peri-urban areas were off the map altogether.

In the 1988/89 Report, "Energy for Development", a new division in the NEC, was described purely in terms of renewables:

> "This division is responsible for identifying and promoting those new and renewable technologies that show potential for exploitation in the Southern African region. The aim here is to provide adequate, appropriate and affordable energy to all"

These two things are synonymous in the minds of the energy bureaucracy, and this was the status of "energy for development" at the launch of the EDRC. It was regarded as a small subsection of the energy sector which had developed out of a research interest in 'alternative energy'. This was the political context into which the EDRC came, and one of the main challenges was to find ways of breaking out of what was in policy terms effectively a ghetto. The way that the energy problems of low-income rural households had been defined as 'technical' effectively depoliticised them. It also, however, created an opening for progressive researchers in an otherwise very tightly-controlled and politicised sector. Precisely because the state had by and large defined this area as one not worthy of much attention, a space could be opened up which was not subject to the control that existed elsewhere; the crack could gradually be widened.

TECHNICAL

Aiming to make a difference by assessing needs and designing and disseminating appropriate technical solutions

This period in the history of the EDRC begins before the EDRC was established. An 'energy and development' emphasis developed at the Energy Research Institute at UCT under the guidance of Anton Eberhard. Research was carried out on energy demand in low-income households, primarily in rural areas, and on possible technical solutions to the problem of supplying these households with energy. Towards 1989, a focus on photovoltaic systems developed, and a lot of research was dedicated to developing reliable and affordable photovoltaic systems. During the period 1989-1998, this research was extended to hybrid off-grid systems, and an increasing focus on the institutional arrangements for dissemination, which became more and more integrated into a national energy policy of electrification of low-income houses, which included grid and off-grid electrification. At the same time, national energy policy formulation required the systematisation of collection of data on household energy demand; available sources were collated into a national database, which was refined over a number of years before being handed over to the Department of Minerals and Energy.

Work on photovoltaic systems was particularly important; the 'loss of power probability' sizing methods pioneered by Bill Cowan were influential in establishing the credibility of solar home systems as a reliable and affordable technology, and paved the way for the mass installation programmes now being undertaken by Eskom and others. The research also led to a range of other initiatives concerned with implementation, such as the SEED project (see below).

From appropriate technology to development

Research on energy issues as related to government policy is an activity without a long history in South Africa. The oil crisis and the looming oil embargo of the 70s prompted the formation of a handful of research centres and some isolated pockets of expertise, encouraged by a worried government. The Energy Research Institute (ERI) at the University of Cape Town was one of these; it had been founded by Professor Dutkiewicz in the mid 70s in the wake of the oil crisis, and produced techno-economic research primarily focused on supply options in the South African energy sector.

In 1982 the ERI had been commissioned to produce a review of 'appropriate technology' by the newly-created Department of Minerals and Energy, indicating the beginning of an embryonic interest in non-grid energy technologies. The researcher at the ERI who did the review was David Naeser; he had been in contact with a South African doctoral student at the University of Edinburgh, a chemical engineer by training, in the process of finishing a thesis on energy and rural development, by the name of Anton Eberhard. After graduating, the now Dr Anton Eberhard was employed by the ERI, nominally to work on a methanol research project, but with the aim of getting funding to start comprehensive research on appropriate technology issues in the energy sector. Eberhard's PhD was a very deliberate attempt to "step sidewards" out of an orthodox engineering career which he had previously pursued at AECI[6], and it exposed him to students from a wide range of other developing countries as well as new kinds of thinking about the relationship between technology and social and economic development.

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6 A large industrial chemical firm in Johannesburg.

He was influenced by Schumacher[7] and other writers on appropriate technology, and particularly by a book written by Piers Cross, who had worked as a water engineer in Lesotho:

> "it was a very remarkable book for me, because it made the bridge between technology and development, development in the broadest sense, between water and health, and it set me thinking about ways in which engineering could be used in a socially relevant way." (Interview with Anton Eberhard)

This new vision of engineering was further strengthened by a year in Lesotho working on an integrated rural development programme, beginning as a PhD student and ending as the technical manager of the project. By the time he submitted his thesis, he had immersed himself in development economics and had begun to develop a critique of appropriate technology based on its neglect of overall economic constraints of underdevelopment.

Eberhard successfully raised funding, mainly through the National Programme of Energy Research (administered at the time by the Council for Scientific and Industrial Research (CSIR), the central government research body), to begin systematic research on energy use by communities that did not have access to electricity, the vast majority of whom were poor and black. At the same time, projects were begun to examine energy alternatives for these communities. While in the past, isolated studies had been done, mainly very localised studies in rural areas, by researchers such as Mark Gandar, and some isolated work had been done on the electrification of Soweto by researchers at the CSIR, there had been no attempt to build up a national picture of energy use by households not connected to the national electricity grid (at the time, over two-thirds of South Africans[8]), and no systematic attempt to investigate different energy supply options. During this period surveys on energy demand were done in a number of areas, including Namaqualand and Bophuthatswana, and studies were done on a range of issues, including a very sophisticated laboratory programme to design efficient wood-burning stoves, and to determine the calorific value of indigenous woods. The stove work involved setting up a special laboratory with on-line computer monitoring and modelling of energy and mass balances, and combustion kinetics. The results were some highly-regarded Masters theses, prototype stove designs, matching and bettering international benchmarks of energy efficiency. For various reasons, efforts to commercialise the research at the time did not succeed. The South African Labour and Development Research Unit also commissioned Eberhard and Gandar to produce some energy papers for the 1984 conference of the 2nd Carnegie Inquiry into Poverty in South Africa (subsequently published in *Uprooting Poverty*, by Francis Wilson and Mamphela Ramphele), including some research on peri-urban energy use, the first work in South Africa on this topic.

As well as employing several researchers, Eberhard set up a Masters course in 'Alternative Energy for Developing Areas', to attract students with a technical background who wanted to apply their engineering skills to development/ environmental ends. The Masters consisted of four courses, namely an introductory course in mainstream energy engineering/economics,, a course in new and renewable energy sources emphasising technologies such as photovoltaics, a course in energy in developing areas and a whole course in technology and development emphasising economic factors and theories of development. The ultimate aim of the course was to produce a new generation of energy professionals who would be well-qualified to deal with the energy demands of the "development sector". The course began to attract a number of students

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7 The author of 'Small is Beautiful'.

8 I use this term in the sense in which it is used now, i.e. not excluding so-called 'citizens' of the so-called 'independent' TBVC states.

with engineering qualifications (and at least one sociologist) who were looking for an alternative to the corporate world of mainstream engineering. Chris Purcell, one of the first graduates of the course, imagined life in a 4x4:

> "I thought where this course would take me was driving around sub-Saharan Africa in a Landrover working with PV systems, which ironically is where it did end up. I didn't end up all around sub-Saharan Africa, but I did end up driving all around the country doing this.. ..It was almost as though [Eberhard] was wanting to turn out practical people, engineers, who could go and work for NGOs." (Interview with Chris Purcell)

Some of the activities of Masters students included monitoring solar home systems in Crossroads and Uitsig, which even though parts of the Cape metropolitan area, were not electrified due to the strange development of the electricity distribution industry under apartheid. Others included driving non-stop through the night to deliver solar panels to the Mpako Rural Technology Unit (the ERI's field station in the Transkei). The context was South Africa in the late 80s, the country was in the grip of an insurrection; the future was uncertain, and there was a feeling that individuals could make a difference in rural areas by their own ingenuity, whereas the problems of urban areas would require the total overthrow of apartheid institutions. The dominant political mode was rebellion, and early optimism about the power of science and technology at the service of the poor contributed to this heroic image of the progressive technologist. At this stage, the byzantine realities of the policy process were confined to the corridors of power, which were still occupied by the apartheid state, and as such, inaccessible.

The research programme, as well as issues raised by the Masters course, led increasingly to a focus on renewable energy technologies as an important component in the solution to the problem of energy provision to poor households. Eberhard visited research institutions in Australia, the USA and Israel. Reviews were undertaken of solar pond and passive solar building technologies. But it was photovoltaic technology which became a central focus. Student projects installed and monitored photovoltaic applications for remote farmworkers, educational television and water pumping for vegetable-growing co-operatives. A common theme was to evaluate the technical, economic and social appropriateness of the technology. Technical and economic barriers seemed likely to crumble in the face of good research; what was needed was a more detailed picture of how these technologies would function in the field. It was felt that there was a need to focus on one area, to facilitate a more detailed study, both of energy use patterns, and as a focus for pilot projects to test potential technologies in the field. Thero Setloane, a researcher commissioned by Eberhard before beginning a career in Anglo-American, located a promising site along the Mpako river in the Transkei. Money was raised from Dutch donors, and a field station was set up in 1989. Bruce Dickson, a civil engineer by training, had worked as a researcher in the energy and development area at the ERI for 2 years. He and his family moved to the Transkei and constructed and managed the Mpako Rural Technology Unit for the following four years. The Unit was a demonstration centre; solar panels and hot water heaters were installed, as well as other renewable technology that the EDRC was interested in promoting or testing in rural areas, as well as related projects such as agroforestry systems.

At the end of the 80s, an agreement was reached between Professor Dutkiewicz, (founder and Director of the ERI at UCT) and Dr Dirk Neetling, the most senior civil servant in the National Energy Council, to consolidate the work undertaken by Eberhard and his colleagues by funding a dedicated research centre to focus on energy and development issues for a period of five years. Looking back in 1999, Neetling described the NEC's initial funding of the EDRC as one of the Council's most significant actions (Interview with Dirk Neetling).

The founding of the EDRC

The EDRC was founded through an agreement between the then National Energy Council and the Energy Research Institute at UCT to fund the establishment of a centre to promote research into the energy needs of "developing" areas. The name of the new research unit was initially the Centre for Research into Appropriate Energy Technologies (CRAET); however Eberhard wanted to emphasise the development aspects of research, so the name was changed to the Energy for Development Research Centre at the Steering Committee meeting on the 22nd October 1990. The initial aims were both to research energy provision for the rural and urban poor, as well as training a corps of new researchers via a postgraduate programme to work in this field. The masters programme was continued from the ERI. The initial funding for the Centre's work was to cover operating costs for five years.[9]

The first nine months or so were spent completing projects, mainly for the NEC, begun in the ERI, and moving into new offices.

The first suite of projects in the new Centre focused on two areas, refined from the initial projects in the ERI; photovoltaics and energy demand surveys. The aim at this stage was to attempt to integrate development theory and technological expertise via a theory of integrated development planning. The EDRC was really operating in a intellectual vacuum at the time:

> "it was fairly unusual, there was nowhere in Southern Africa that did this sort of thing.. EDRC was really the place.. it's only recently that you get your pockets of expertise elsewhere, in the energy and development area" (Interview with Mark Borchers)

Not only was there very little research being done, but there was almost no awareness of the problems that the EDRC was absorbed by amongst the energy community. Eberhard remembers that in the late 80s, the EDRC tried to demonstrate what it was like not to have electricity, and explored appropriate energy supply options, mainly for rural areas.

> "I remember at quite a few national conferences getting quite strong reactions, not anti reactions, but reactions saying 'gee, we didn't know'" (Interview with Anton Eberhard)

This was one of the side-effects of apartheid, that mainstream planners saw the energy sector as consisting of white households and industry. A new concern was with 'developing areas', which meant deep rural areas, but they could not perceive anything in between. This was at least partly an outcome of apartheid's vision of the urban landscape, which perceived black urban residents to be 'transient' and at heart fundamentally 'rural'.

The initial core grant covered the salary of the director, a senior researcher, a post which was filled by Bill Cowan, a graduate of Eberhard's Masters programme and a sociologist by training, and an administrative assistant, Pari Callias, who did everything from editing reports to keeping track of books in the tiny embryonic library. Cowan had written a remarkable Masters thesis titled *Photovoltaics for Educational Television in Rural Schools*, which covered a whole range of topics

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[9] To put this in perspective, according to the NEC Annual Report, the EDRC received a total of R755,300 in 1991. By comparison, the Atomic Energy Corporation received R645,200,000. 'Energy for Development' research in the NEC received a total of R2,670,000, which means that nuclear research was receiving about 242 times as much money as 'development' research Those lucky enough to be connected to the electricity grid did not actually benefit from this largesse. The only part of Koeberg, South Africa's only nuclear power station, that was South African was the fuel, which Eskom was paying several times the world spot price for; so electricity consumers were effectively subsiding the AEC too.

from technical analyses of the viability of PV systems for this kind of application to an overview of the social and economic aspects of such a project. The thesis was focused on an existing project in Bophutatswana, and concluded, amongst other things, that the unit cost of solar energy could be dramatically reduced by a more sophisticated system sizing method. It also demonstrated that political and social issues crucially affect the chances of success of technology applications. This research formed the basis of later EDRC research on photovoltaic systems.

These three were joined by five other Masters graduates, Chris Purcell, Mark Borchers, Mark Davis and Glynn Morris, who established the EDRC beer club, and later by Paul Theron. Research efforts in the early years were characterised by a focus on two areas: developing implementable off-grid technology for poor households, and the electrification of urban and peri-urban areas.

Remote areas power supply (RAPS) development, 1989-1997

The RAPS programme as a technical project began as the core of the EDRC's research effort, and gradually became marginal as more attention was focused on policy-related issues and social and economic research. This sort of research eventually ceased in 1998, and left a legacy that formed the basis of much of the multi-million rand off-grid investment of the late 1990s, as well as the CAREDA programme that was its successor (see below). The programme saw a succession of gifted researchers and graduate students, led by Bill Cowan, produce ground-breaking research. The initial research was almost purely technical in nature, and involved the development of reliable off-grid systems, mainly using PV panels. The research led to involvement in contributing to the development of national and international technical standards for PV systems. Further technical research was done on hybrid systems, which articulate power from a number of different sources. From the early 90s, however, more research was done on dissemination issues; institutional and financial factors as well as questions concerning planning. Towards the end of the programme there was an increasing focus on off-grid electrification strategies; solar systems are now an important component of the general electrification programme.

• The initial RAPS design programme

The RAPS programme was the core of the EDRC's research activity in the early years. It was a three-year project funded by the NEC, and the core team of researchers were Bill Cowan, Mark Borchers, Chris Purcell and Glynn Morris, with some help from other researchers and students from time to time. The project which was mainly, but not exclusively, concerned with photovoltaics, consisted of three aspects.

The first aspect was focused on the question of design. The problem is what system to install for what application, and what the capacity of different components should be, given a minimum required level of required performance and an appropriate budget. In the case of photovoltaics (PV) the problem in perhaps more acute; besides the complexity of battery storage systems, PV cells perform differently at different temperatures and in different weather, as well as at different times of the year. The core of the solution to these problems was developed by Bill Cowan – the "Loss of Power Probability" sizing method. Previous methods had used averages, for example, average solar radiation for the worst day of the year, or average system conversion efficiency. Margins are added to compensate for inaccuracies, usually leading to a system with too much capacity for a specific task. This is a crucial problem in a development context, as excess capacity equals excess cost, which could make or break a rural electrification programme. The EDRC method for system sizing applies different loss of power

probability requirements to different end uses; for example, a vaccine refrigerator in a rural clinic requires very high reliability and therefore justifies a certain amount of excess capacity, whereas a normal user might be willing to risk not having light several days a year in exchange for a much cheaper system. In addition, use of data on sunshine in a specific area (collected by the Weather Bureau) can be used to calculate the probable level of solar radiation over short periods: "Solar systems with energy storage are critically affected not by any single day's weather, but by a cumulative sequence of bad days, leading to storage depletion.." (EDRC Annual Report, 1989-92). These factors are combined, "enabling prediction of the probability that a given system would fail to deliver its design load" (ibid.). Based on this method, Mark Borchers, with contributions from other researchers, developed the POWACOST software, which both calculates the comparative cost of different RAPS systems for specific applications, and, given a specific load and loss of power probability, calculates the optimum size of the components of a PV system.

The second aspect of RAPS research was on "balance-of-system" components, such as batteries and regulators. Batteries are of central importance in RAPS systems, and their behaviour under operating conditions is as complex as that of PV panels. The aim of this part of the project was to study batteries and other components of RAPS systems, with the ultimate goal of improving reliability of systems as a whole. Chris Purcell and other researchers constructed a complex test rig to test batteries, inverters and regulators, in a systematic fashion, as well as to evaluate new products and diagnose problems with faulty systems that had failed in the field.

The third aspect of the RAPS programme involved the production of the RAPS Product Directory and the RAPS Design Manual, both aimed at making information on RAPS systems (design and components) widely available to industry and consumers. The Design Manual was a remarkable achievement: at the time, it was described in the promotional literature of a US solar systems components company as the best reference work of its kind currently available; it is still being widely used today.

- **Solar standards**

Technical standards are of great significance in the sustainable use of new technology. The EDRC was involved in two areas of standards work. The first was a re-examination of solar water heater standards, as existing standards were unable to predict the performance of different heaters; however, the most important work was on PV systems. Actual testing of the panels themselves was too expensive, and was done elsewhere in the world, but what was of more concern was the testing of PV systems as a whole, using loss of power probability methods. These methods were tested in collaboration with Eskom's Engineering Investigations division, as well as to evaluate commercially available systems. The work broadened out after 1994 to include a range of other considerations to improve the overall reliability of PV systems. These included the development of a code of practice for the installation of PV systems, extended and revised from a code developed by the Botswana Technology Centre, which was widely used in Southern Africa. Methods were also developed to test installed systems.

- **Water pumping**

One specific RAPS application for which there seemed a significant need in rural areas was water pumping. EDRC researchers, particularly Richard Gosnell and Mark Davis, did extensive research, and Mark Davis spent some time at the EDRC's field station in the Transkei (see following section), the result of which was a comprehensive manual on designing PV water pumping systems in 1993.

The Mpako Rural Technology Unit

The Mpako centre had been set up by Eberhard and Bruce Dickson just before the EDRC was established. One of the initial aims was that the Unit serve as a field research station; research into appropriate technology options had been made considerably more difficult by the need to seek contexts in which to research and test the technology under real conditions. In addition, research directions in the EDRC would benefit by exposure to real problem contexts encountered in the field. This necessitated the forging of relationships with rural communities, which were often complex and difficult to maintain over time. A permanent research station, on the other hand, offered a stable focus which could be maintained over years. In reality, however, this arrangement also proved difficult to sustain. Given the massive basic needs of underdeveloped areas, the Rural Technology Unit soon developed into an NGO and increasingly fulfilled the role of a rural development service organisation, employing a number of people from the area. There was ironically from the beginning a lack of common ground between the needs and desires of the local community and what the EDRC had hoped to achieve through the Unit in terms of technology development. Bruce Dickson, who ran the Unit for the first four years, remembers that local communities wanted basic tried-and-tested services such as spring protection, which required no innovation. He was unprepared for the urgent problems that people in the area were experiencing; resources were focused in this direction, which left little space for experimenting with technical innovation:

> "The EDRC was into solar pumping....which was like trying to run before one could crawl.. ..you've got to respond to their needs if you're going to be out there, otherwise you can't interact and people don't want to know about you." (interview with Bruce Dickson)

As far as testing new technology in the field, Dickson found himself at the nexus of a complicated web of conflicting demands and dilemmas. On the one hand, the necessity to forge relationships with the local community and local authority structures (both traditional and from the then Transkei 'government') to establish a legitimate local presence, involved consideration of their immediate requirements; on the other, there was a need to persuade the same local community to try unknown technology to further the research work of the EDRC. The two solar technologies, for instance, that the EDRC was pursuing at the time, photovoltaic pumping and lighting, were, according to Dickson, just too unreliable and technically unsustainable to be of much use in that environment (reliability has since improved dramatically, and understanding has grown too on the institutional support necessary for sustainable use of the technology). PV pumping in particular he describes as "a disaster"; too many components, too many possible malfunctions, and no local capacity to maintain the technology. In addition the EDRC had a complex task of managing the research process in a development context, the same dilemma facing most research organisations in the same environment. Doing research on a national basis might succeed in developing reliable technology systems (as it did in the case of solar home systems), but risk non-involvement of local communities and non-sustainability of technological solutions, whereas responding only to local needs would risk non-engagement on a policy level.

One of Eberhard's original motivations for setting up the Unit had been to generate knowledge and experience of real conditions in underdeveloped rural areas that would inform the EDRC's research foci. Even though Dickson developed a deep understanding of local conditions and problems, this knowledge was not systematically transferred. Links between Cape-Town-based researchers and the unit were weak; apart from tri-annual visits by Eberhard, Mark Davis was the only researcher to spend a significant amount of time there doing research on PV pumping, as well as assisting in day-to-day running of the centre. Dickson

himself spent his days managing the logistics of local projects, raising funds from a variety of donors, including the IDT, the original Dutch funders and a range of other international donors, doing administration and attending community meetings. Projects mostly involved building spring protection units, water tanks and laying pipelines, as well as a tree nursery for agroforestry purposes; some effort also went into trying to get fuel-efficient woodstoves into commercial production. Much research in the ERI and the EDRC had been done on woodstoves, and Dickson used these specifications to persuade Falkirk, the British stove manufacturer, to manufacture a fuel-efficient stove. Unfortunately the project, after producing 50 prototypes, collapsed when the parent company disinvested, and the local company pursued other options such as gas.

Dickson also cites a lack of background in development, and a lack of evaluation. The only form of project evaluation was the funding process. The EDRC did not have the capacity to oversee and sustain the Unit, and as the Centre's focus shifted elsewhere as the EPRET project developed, the Unit became less and less of a research unit. The minutes of the EDRC Steering Committee of October 1992 report that "Dr Eberhard reported that a true reflection of the activities in Transkei would indicate that development work constituted 95% and research only 5%" (SC minutes 5/10/92). The following Steering Committee acceded to Eberhard's request that the Unit be established as an independent NGO. Eberhard also recorded in the minutes that the Unit was operating very successfully as a development organisation, and the Unit had apparently received requests to replicate itself in different parts of the Transkei. Links with the EDRC were finally broken when Dickson and his family moved back to Cape Town in 1994, although the Unit continued to operate as a local development organisation for another four years.

Chris Purcell, Mark Borchers and Glynn Morris left the EDRC in 1993 to found the Energy and Development Group (EDG), a consultancy dealing specifically with energy and development issues, with a particular focus on renewables. There were several reasons for this development. It was a fulfilment of Eberhard's original vision, that of establishing a body of professionals who would be expert in off-grid energy applications, with a strong development emphasis. In addition, Borchers and Purcell cited a declining interest in technical work in the EDRC after 1990 or so. More importantly, the EDRC was having to deal with a lot of consultancy work on renewable technology, which was detracting from research. There was clearly a market for this kind of work, and the RAPS project was drawing to a close; there was the potential for practical RAPS work for the IDT, electrifying rural clinics. The EDG was set up as the only "renewables implementation consultants" in South Africa. The group consulted for a wide range of organisations in the energy sector on rural energy issues. The group has and still does work extensively with the EDRC, providing capacity that the EDRC does not possess. In this sense, the formation of the EDG was indicative of a new direction within the EDRC, as well as a sign that the new field of energy and development had come of age.

Institutional and financial studies of off-grid electrification

These studies became increasingly important, as technical hurdles were overcome, and more attention was focused on implementation. Mark Davis undertook a comparative study of institutional and financial factors in other countries and compared these with the South African experience, and a study was undertaken to monitor an IDT project to install PV systems at rural clinics. Both these foci developed into a major concern with solar home electrification after 1994, when it became much clearer what the limits of the grid electrification programme in rural areas might be.

> "Even if the current rural grid-electrification trends continue, at least 1.8 million rural households will remain without grid supply by 2010 - and probably more.." (Annual Report 1995-6)

This coincided with other developments in the development of solar technology and its acceptance as a viable option for mass electrification, raising the question of a possible mass market for the technology. The confluence of these factors led to a combined European Commission/South African project, undertaken from 1995-6 by Bill Cowan, Phillip Geerdts and Douglas Banks, the aim of which was to set the scene for large-scale installation of solar home systems. The project produced a report titled *Solar Home Systems: Techno-Economic Study*, which summarised the project's findings, as well as 19 annexes. The project had three main aims, which were to assist in the preparation of pilot projects to test suitable organisational , finance and delivery methods, to monitor and evaluate pilot projects, and based on this experience, to draw up policy recommendations and a plan for large-scale solar electrification. These aims were modified on account of delays in the establishment of pilot projects, and as a result the output of the project put more emphasis financial, institutional and technical aspects of a potential large-scale programme, including necessary support measures including capacity-building, standards and marketing mechanisms. Annexes included reports on experience in other developing countries, overviews of institutions involved in financing in rural areas in South Africa, demand modelling, a number of case studies tracking the use and impact of solar home systems, and an economic analysis of the costs and benefits of subsidising the provision of solar home systems.

- **Hybrid systems**

Some research was begun in 1994 on hybrid systems, to explore the technical aspects of combining, for example, PV systems with small diesel generators. The initial study was funded by the DME. A more comprehensive project was developed from this one, for the DME and the National Renewable Energy Laboratory (NREL) in the USA. The aim of this project was specifically to develop systems which could be used as part of RDP projects in remote rural areas unlikely to get access to the electricity grid. The project had three phases. The first was the systemisation of the design process aimed at "creating a conceptual framework for optimising hybrid systems" (Annual Report 1994), then a design tool, and set of data on weather conditions that could be fed into the design tool to produce a least-cost system. The second was the production of a design guidebook in collaboration with NREL. This work was mostly done by Gabriele Seeling-Hochmuth, who, due to the complexity of the problem of properly articulating multiple variable sources of power, used a sophisticated mathematical approach based on neural networks. Frank Hochmuth and Ahilan Kailasanathan also researched aspects of hybrid systems during this time.

Data on national energy demand

Unlike many other countries, South Africa had extremely limited information on household energy demand in the mid 80s. Eberhard's first research programmes in the ERI began to remedy this problem, but it was only during the EPRET project (see below) that a systematic attempt was made to build up an accurate national picture. Local surveys were collected into an embryonic database to provide estimates for national energy demand in "under-developed" urban and rural areas during the EPRET project. During the EPRET project, the process was designed and implemented by Hilton Trollip, who was assisted by Yaw Afrane-Okese, a chemical engineer who had just arrived from Ghana to do a Masters degree at the EDRC, and had some experience in doing baseline surveys in Ghana. The initial process involved doing complicated extrapolations using GIS systems, to

determine how many households there were in South Africa, and what their socio-economic profile was: this information was not available at the time. This was politically symbolic as well as significant for planning; these were people that had not existed before as far as the state was concerned; Trollip commented that "by enumerating and quantifying the masses, they became real" (Hilton Trollip – personal communication).

The completed database was the first of its kind in South Africa, if somewhat uneven due to the rather erratic sources of data that it depended on. Afrane-Okese took over the database project after the completion of the EPRET project, which was expanded after EPRET on receiving further funding from the DME. A "National Domestic Energy Use Database System" was produced, with the aim of rationalising data collection and collation for use by planners and policymakers, and as a basis for policy research. The data was considerably enhanced by addition of household data from a World Bank/SALDRU study completed in 1993 (The Project for Statistics on Living Standards and Development). An easy-to use user interface was developed and the database was eventually put onto the internet. This database was eventually handed over to the DME, but the department has so far not had enough capacity to maintain and extend it.

Two other projects developed from this initiative. The first was a set of databases for the National Electrification Forum (NELF), one containing supply-side information and the other demand-side information, on the electricity industry, to develop a quantitative framework for planning electrification projects, on which both Trollip and Afrane-Okese worked. This involved the collection and collation of data on household income, appliance ownership and affordability data, much of this by consultants. The second major project was commissioned by Technology Research and Investigations at Eskom, designed and implemented by Afrane-Okese. The aim of this project was to use household demand data to consider alternative energy supply mixes for household energy provision, and it included consideration of consumption patterns, factors determining domestic energy use, and studies determining the best fuel mix for households with different socio-economic and demographic profiles. On the basis of this data, a study was completed on future scenarios for household consumption. Two strategies were considered; electrification and energy efficiency measures. It was shown that in combination, these two strategies could actually reduce household energy demand by 2010, while increasing the access to energy by these households. Some collaborative work was done with the Tellus Institute in the USA using their Long-range Energy Alternative Planning (LEAP) model, which was refined in the process. Afrane-Okese also did some work using this model to examine the effect of appliance penetration, based on the theory that access to appliances was more decisive than the availability of electricity in itself.

Work is now being done in the Energy, Efficiency and Environment programme on the LEAP 2000 Initiative. As part of a global initiative, the EDRC is conducting workshops and developing training materials to contribute to the development of state-of-the-art analytical tools that "consider the full societal costs of energy investments and addresses needs of human and economic development".

- **Fuelwood**

EDRC applied research in this area begun with early exposure to Mark Gandar's work at the Institute of Natural Resources in Natal, Anthony Williams' research on biomass and the Mpako Rural Technology Unit, where a number of different approaches to agroforestry were tried, including attempts to build fuelwood trees into traditional cropping systems. Some research was also done by Mark Davis, who for his Masters thesis, built a sophisticated test rig to determine the combustion properties of various indigenous wood species. Following this, one of the EPRET research papers, *Afforestation and woodland management* was written by Mark Gandar, and focused on assessing demand and considering various

options in increase supply, including the possibility of a national programme to increase afforestation. This focus was refined in 1994, when the South African Nature Foundation funded a study on traditional management of natural woodland, about which very little was known. The aim of the study was to understand these practices in scientific terms; in other word, on what basis did communities limit access to certain forests, and if these bases were consistent with ecological data. The project also examined fuelwood sources on different types of land, such as ranchland and formal conservation areas.

The EDRC was contracted to synthesise work carried out on biomass over two years by the DME, which was done in 1994 and 1995 mainly by Williams and Dickson, but no significant policy outcomes were forthcoming, partly because the issue falls between two separate departments (DME and the Department of Water Affairs and Forestry), and partly because of the fact that fuelwood is not a market commodity, and thus, unlike, for instance liquid fuels, does not involve large stakeholders. However there are signs that this might change, with new initiatives being developed by both Forestry and energy planners connected with off-grid electrification.

POLICY / POLITICAL

Aiming to make a difference by acting strategically to influence agendas, building relationships with key players and forging creative links between research activity and the policy process

The policy focus began in the EDRC with research into urban electrification. This field had previously fallen into a policy chasm between the apartheid energy sector (which had electrified almost all white households in white 'group areas') and the new, if small, government interest in providing energy services to 'developing communities' in rural areas. Unlike rural energy problems, the intervention required was not technical, but political and institutional; it was necessary to explore ways in which resources in Eskom and the state could be redirected to electrification.

The time was ideal for the raising of these issues. Eskom was cautiously receptive, and the negotiations leading to the first democratic elections in South Africa were opening up space to intervene in national policy debates, as well as putting political pressure on the state to become more responsive to the needs of the majority. In this context, the EDRC raised funds for a wide-ranging policy research project, the South African Energy Policy Research and Training Project, which produced findings on a range of issues related to low-income household energy supply. In addition, and perhaps more importantly, in the run up to the 1994 elections a group of EDRC researchers engaged closely with the ANC's policy structures, and succeeded in getting energy issues onto the left's policy agenda. This process also saw EDRC researchers writing the energy section of the RDP and playing a decisive role in the Green and White Paper processes, and playing an important part in the establishment of the National Electricity Regulator. This quite activist role of EDRC researchers was unusual; it was the outcome of a specific political situation, where there was no legitimate government. The result of this was that in the run-up to the elections, policymaking in many sectors effectively moved out of government into the context of the negotiations between the ANC and the Nationalist government, where not only the content of policy was being decided, but the process: who should be involved, what should be considered. Thus the closeness of the EDRC to the ANC at the time was not because of a partisan pursuit of a party agenda, but because of an interest in the policy process *itself* being transformed, along with the political order, to facilitate a more representative energy sector more responsive to the needs of South Africans as a whole. After this period, the EDRC's engagement with political actors has moved onto a different plane, to a role which emphasises support and high-quality research, aimed at increasing the quality of policymaking. Maintaining productive relationships with the Minister, DME staff, the Parliamentary Portfolio Committee on Minerals and Energy and latterly, the Department of Environmental Affairs and Tourism, are an important aspect of the EDRC's work; these relationships help both to set research agendas as well as ensure that EDRC expertise is utilised to maximum effect in the energy policy process. One of the ways in which this is done is through a support process for the PPC, the Minister and the DME, which forms part of the EDRC's Energy Markets and Governance Programme; another is support for climate change policy and negotiation by the Energy Efficiency and Environment programme.

Research into electrification

In the late 80s, two related changes were posing unique challenges to the electricity industry in South Africa. The first change was that the distribution industry was

being racialised to a far greater extent than ever before. Once the Botha government had been forced to recognise that influx control was unenforceable, and that black South Africans would have to be recognised as permanent residents of South African cities on an unprecedented scale, a system of racially-segregated local authorities was imposed. This also involved the thorough racialisation of service delivery. Electricity had been effectively racialised by access – most white South Africans had access to electricity, whereas most black South Africans did not. This division was formalised, and "black local authorities" were set up to administer service delivery in designated black group areas. The political illegitimacy of these authorities, resulting from their violent imposition on communities and their appointment through sham elections conducted during a 'State of Emergency' under which most representative political organisations were prohibited from operating, combined with a chronic lack of resources and capacity, led to the swift collapse of services in these areas, exacerbated by a boycott of local taxes and service payments by residents. This situation led to the second change in the electricity industry, which was that Eskom took over the distribution of electricity in some of these areas, in the absence of a credible local authority.

In this context, interest in the electricity industry was sparked in the EDRC by Paul Theron, who completed a Masters thesis titled "Public and Private Sector involvement in the Provision of Electricity in Urban Areas of South Africa". In his thesis, Theron outlined the institutional and economic dilemmas facing the electricity industry. Whereas previously in South Africa electricity policy debate had primarily concerned questions of security of supply and the development of the national grid, questions about distribution, and specifically questions relating to the electrification of millions of urban homes that had been neglected by apartheid, were now of crucial importance. Local authorities, serving white residential areas and local business and industry, had traditionally assumed this role, and a complex web of tariffs had ensured that local taxes (for white residents) were subsidised through electricity sales. Provision to most non-white residents, and a massive backlog in new electrical connections, was handled by underresourced local authorities in a state of collapse, or on an ad-hoc basis directly by Eskom.

The question of the electrification of these households in urban and peri-urban areas was thus the focus of concern to Eskom, to local authorities and to the emerging government-in-waiting. If institutional and political issues could be resolved, it would be possible to make an enormous impact on a few million households within a fairly short space of time. Several key projects were undertaken during this period, which laid the basis for later decisive work on electrification policy.

- **Analysis of new electrification schemes in the Western Cape, 1 and 2**

This project, started in 1991, aimed to map out the parameters of the problem. There was almost no systematic data at the time: Eberhard recalls visiting the office of the city engineer to enquire about the number of unelectrified houses in Cape Town, and being shown a series of individual street maps indicating the electricity network. No-one possessed the data to provide an overall picture of the situation – electrification had never been an issue, either in terms of planning or (white) municipal politics. What the study set out to discover was how much electricity low-income households used, how electricity might be used to generate economic activity, what sort of appliances were used, what methods of payment were used, and how successful these were, and whether this data could be correlated with socio-economic data, so that it would become possible to predict the likely consumption of a newly-electrified area. Two areas were compared; one in Langa and Gugulethu, which had been electrified for some time, and another in Khayelitsha, which was newly electrified, to get some idea how electricity use

developed after electrification. The original study was designed by Paul Theron and funded by the DMEA. Subsequent studies were undertaken over a period of 5 years, to get a clear picture of changes in consumption over time (see Social, below).

- **Analysis of the electricity distribution sector**

The aim of this project was to examine the institutional structure of the electricity industry in South Africa, and the impact of this structure on potential electrification schemes. Due to the bizarre principles of local government under apartheid, the distribution industry was plagued by remarkably complex divisions of authority, often in very small areas. The study aimed at reviewing these structures in the light of existing electrification projects, and look at alternatives in structural and financial terms.

- **Engaging with the electricity industry**

This interest in electrification led the EDRC to engage for the first time with the economic giants of the energy sector on a level of policy. This was an unusual move at the time. Chris Purcell remembers being horrified at the prospect of the EDRC engaging with Eskom on this level; at the time they were seen as part of the apartheid state. Of all the big players in the energy sector, however, Eskom proved most amenable to outside influence, and began to realise the wisdom of reaching an understanding with the new order. Mark Pickering, who was seconded to the EDRC from Eskom during the EPRET project, attributes this crack in the apartheid façade to Eskom's CEO at the time, Ian McRae. McRae had also had to deal directly with the civic organisations in Soweto after Eskom took over electricity distribution there, meeting leaders such as Frank Chikane. At the same time, EDRC researchers had been attending national energy conferences, including those of the Association of Municipal Engineering Undertakings, and giving papers to get electrification onto the agenda, and raise issues relating to the distribution industry, both amongst establishment organisations such as the AMEU and Eskom, as well as in more progressive forums such as the Local Government Policy and Planning conference in Cape Town in 1992. The watershed, however, was the organisation of a conference on electrification under the banner of the ANC.

The ANC Electrification Conference and NELF

The conference was organised by the EDRC, but under the auspices of the ANC. Both Theron and Eberhard were ANC members, and had become increasingly involved in the ANC's Science and Technology Working Group, which was where the energy policy of the future government would develop. This was a major risk for the EDRC, which still depended on government funding, as well as an unusual step for a 'neutral' research organisation, but these were unusual times, which required unusual measures: the ANC of the time was not a political party in the ordinary sense, but the main player in negotiations with government about the future form of South African political life. The ANC had the legitimacy, which no other grouping had at the time, to establish a new policy agenda. The aim was to establish electrification as a central feature of the energy policy agenda, as well as to position the EDRC in the centre of the increasingly fluid policy environment, as policymaking moved out of government and into national negotiations between government and opposition over the form of a new political order.

A wide rage of stakeholders were invited. Some DME staff were keen to attend, but a recalcitrant Minister prohibited any departmental involvement. Eskom made a decision not to attend, but one of their employees accepted an invitation from Paul Theron. Mark Pickering, himself a student activist with political connections before taking up an engineering post at Eskom, was an ANC member, and part of the ANC Science and Technology Working Group. This caused a minor crisis in

Eskom: "There was no history of Eskom engaging with the ANC", recalled Pickering. In addition, the relationship between the EDRC and Eskom was "very uncertain":

> "So I just said, 'Well, I'll come', and all hell broke loose in Eskom at the prospect of an Eskom employee going to an ANC function, and it was discussed at the management board, I think it was discussed with the chairman, and I think they realised that they couldn't actually do anything about it, because Eskom was being pressured to attend, and they'd taken this policy decision not to attend, so eventually they sent observers, as a last-minute compromise.." (Interview with Mark Pickering)

The conference succeeded in both putting electrification on the policy agenda and clarifying a new role for the EDRC, which saw the organisation engaging with the policy process in a much more direct and political manner. Trevor Manuel, now Minister of Finance, was one of the delegates. During breaks in the proceedings, calls were made to leaders in the electricity sector, and the seeds were sown for the establishment of the National Electrification Forum, which later lent emphasis to the inclusion of electrification in the ANC's Reconstruction and Development Programme, as well as the establishment of the National Electricity Regulator, a few years later.

The developing interest in policy

Interest in national policy issues began with this interest in electrification. It was clear by now that it might be possible to achieve things by engaging with the policy process in the energy sector that no-one had dreamed of a year or two before. Pickering put it like this:

> "..in terms of the state energy sector.. [electrification] was the first real crack where the disjuncture between what the state had set up as its energy policy, its concentration on security of supply; the disjuncture between that and the real needs of the population began to show; an institution within that whole group of energy supply institutions began to question its role. So it was a very important area." (Interview with Mark Pickering)

This development signalled a shift for the EDRC from a focus on a small and neglected aspect of existing energy policy to a growing inclination to redefine energy policy in terms of 'energy and development' concerns – the issues that the EDRC dealt with were beginning to achieve central political importance, which led Eberhard and Theron to begin to conceive of a different role for the EDRC. Gradually the focus of research had been shifting from technical research and demand surveys to the role of players such as Eskom, and the importance of national policy in influencing these players. They conceived of a research project on what for the EDRC was an unprecedented scale, to exploit this new potential for policy debate, which would materialise as the South African Energy Policy Research and Training Project (EPRET).

Creating capacity, laying foundations: The EPRET era

The ANC electrification conference had brought with it the more overt development of a loose-knit group of ANC activists structured around the Science and Technology Working Group, some of whom worked in the EDRC, creating a new focal group at the forefront of policy research and advocacy in the energy sector. Because of the unusual political situation, access to key decision-makers and potential decision-makers was unparalleled for those with the right connections and the right political acumen. At the same time, public policymaking

in South Africa was a new experience, particularly in the energy sector. In the past, policy had either been arrived at by decisions made by a small group at the top, behind closed doors, or by long technocratic processes which were often designed to justify policies rather than make them, and could hardly be said to be "public" in any sense. As a result, negotiators used whatever skills they had picked up from political involvement, or from newly-established courses in public policy. The EPRET project was the EDRC's first real attempt to influence the policy process in a significant way, and it began a long process of critical reflection on the relationship between research and policy in the sector. Clive van Horen, one of the EPRET researchers and later deputy director, describes this phase in the EDRC's history as follows:

> "..there was a massive window which was completely open for changing policy, for actually writing policy, so all the research that we were doing, fortunately because of political connections, fed straight into the RDP; basically we wrote the RDP, two or three pages on energy, and there were two reasons we were able to do that: one was that we had done some work and we knew something about it, I wouldn't say a huge amount, but more than anybody else, and secondly, we had political connections.. ..politically we were in the right place at the right time. Without either of those it wouldn't have been there.. ..It was very unorthodox in research terms. That was what made South Africa so fascinating at the time; it was a clean slate.." (Interview with Clive van Horen)

The years from 1992 to 1994 were very unusual in policy terms. Crisis after crisis created a set of negotiating forums, typically containing representatives of government, business, labour and opposition groups, which took over policymaking and governance in a lot of sectors, effectively turning government inside-out. This situation created great uncertainty for the major players in the energy sector, and rendered a lot of these more open to engagement on policy questions than they might have been otherwise; straws were clutched in the hope that they might develop into something more substantial, which they frequently did. The key to access to major players during this process was political credibility; the involvement of key EDRC researchers in ANC policy committees was of vital importance to the influence that EDRC thinking had on the policy process at the time, and it was the informal networking activity of individuals that placed the EDRC close to the centre of the energy policy process during those years. Later, in the more stable political environment of the post-94 era, the EDRC developed a range of other strategies to gain access to government and other players in the energy sector; interaction became more complex, and happened at more levels; research became more interactive, and more thorough. The period leading up to the election was a time in which a new paradigm for energy policy was established; after this, research and advocacy engaged much more closely with the details of the new framework.

The EPRET project

Thinking in the EDRC had been drifting towards policy, and a policy project was alluded to in the 1989-92 Annual Report. A visit by a member of a UK-Dutch NGO, ETC, which was looking for prospective projects to fund, prompted Eberhard and Theron to write a multi-million rand research proposal for a policy research project focused on the energy needs of poor households, and related structural and institutional issues. The aim of the project would be twofold; on the one hand:

> "Its primary object would be to raise to the fore of energy policy issues our traditional areas of concern, that of widening access to energy services for the poor, urban poor, rural poor." (Interview with Anton Eberhard)

In other words, the EDRC was going to attempt to put "energy for development" onto the rapidly emerging energy policy agenda of the government-in-waiting, and to turn on its head the apartheid obsessions of racially-segregated energy service provision and inefficient energy security investments, which had formed the core of apartheid energy policy. Theron had also made a strong case for a training component; thus, another aim of the project was to train a corps of black researchers in the sort of policy analysis that would equip them to make energy policy in a post-apartheid South Africa, which was:

> "our first structural attempt to address past imbalances.. ..an explicit commitment to increase the number of black researchers" (Interview with Anton Eberhard).

Until this point in the EDRC's history, the skills utilised in the organisation had mainly been technical in origin; in short, the organisation had reflected, with a few exceptions, the traditional social composition of the South African engineering profession; white and male. With a shift away from technically-based projects, a wide range of skills were now brought to bear on the problems of the energy sector. While the EPRET researchers were still predominantly white, there were a significant number of women amongst them. Another development of great significance was a large number of internationally-recognised scholars from other countries, who were engaged both as researchers and as part of a Project Team, to provide international peer review of the research process.

- **The people and the structure**

The project was designed in three phases; the first was a preparatory phase, the second phase would be the research work itself, and the third phase would involve the production of syntheses of research aimed at specific stakeholders, involving multimedia presentations, as well as the publication of a book. The project was managed by a Project Team, co-ordinated by Paul Theron, appointed as Project Manager, Anton Eberhard, whose official position in the project was Research Supervisor, and Karen Martin, employed as Project Administrator; she took on some management functions as well. An international panel of energy policy researchers provided peer review of reports and participated in workshops. Another panel, of South African academics and representatives of key local institutions also provided evaluation and comment. The researchers themselves came from a wide variety of backgrounds, including a small number from Scandinavia: Raymond Auerbach and Mark Gandar came from Natal and worked on forestry; Geoffery Boerne was based in Cardiff and researched energy aspects of transport policy; Hans-Erik Dahl and Tore Hove came from Norway and researched rural electrification and southern African linkages; Hamida Fakira came from Mauritius to complete a degree in electrical engineering at UCT, before joining EPRET to research energy for micro-enterprises; Ilne-Marie Hofmeyr had a degree in music, and registered for a masters degree in the EDRC as well as doing research in the EPRET project on energy for farmworkers; Guy McGregor was Corporate Economist at BP Southern Africa, and had done a lot of work on LPG and paraffin use in South Africa, which equipped him well to research household petroleum products; he was also one of the few people at the time who had access to data on the use of these products, through his links with BP – this information was classified until 1993; Mark Pickering was seconded from the Eskom pricing department, to research electricity pricing; Wrenelle Ruiters had a background in management training, and she researched human resources in the energy sector, and the impact of policy change on these, as well as supervising the trainees; Grové Steyn had worked as an engineer in the electricity sector, and researched the structure of the distribution sector in relation to electrification; Cecile Thom had a background in theoretical physics and had completed the ERI masters course, and co-ordinated the research on rural energy policy in EPRET with Ernest Khosa; Steve Thorne had a background in engineering and researched urban

electrification as well as energy efficiency; Hilton Trollip had a background in engineering, and produced a background study of the South African energy sector, as well as doing research on energy demand analysis; Clive van Horen was a chartered accountant by training (and was completing a Masters in environmental economics), and researched environmental implications of current and future energy scenarios related to the urban and rural poor, and as well as looking at questions of financing; Anthony Williams had worked in the energy sector as a consultant, and researched energy supply options for urban and informal settlements. He had also played a part in building contacts with the Dutch funders while working in the Netherlands; finally, Amita Makan, who started off in the EPRET project as a trainee.

- **The intellectual framework and the research**

The EPRET project was structured around what the *Research Outline* (EDRC 1994) describes as the "most critical issue on the energy policy agenda", namely "the need to widen access to energy services for the urban and rural poor". The intellectual framework for the project was influenced by comparable emphases on demand in other developing countries, in which context an approach called Integrated Energy Planning had been pioneered: this was outlined in a paper titled "Integrated Energy Planning: A methodology for policy analysis and research" by Anton Eberhard. The document was "a methodological piece which situates *policy research* within an overall analytical framework of *planning* to achieve specific goals" (Eberhard 1994). Integrated energy planning is presented here as an antidote to the traditional supply-side planning that had dominated the South Africa energy sector for so long; striving to "understand the links between energy supply and demand sectors and with macro-economic factors and socio-economic objectives – that is, the entire energy system". Thus, considering the possibilities and limitations of "energy services for the urban and rural poor" required the consideration of every aspect of the energy system, as opposed to mere supply issues.

The approach had been pioneered in a number of developing country contexts in the 80s, and was dependent on having a lot of information that was unavailable in South Africa; while information on the supply side for "modern" energy sources was moderate to good, there was virtually none on demand for "traditional" fuels, and since the "modern" fuels generally used by poor households were mainly petroleum products, when EPRET started it was still illegal to possess information on the demand for these. The research was structured into a overview of the development context of the South Africa energy sector, a background study of the energy system, and an in-depth focus on the supply and demand sectors as these related to domestic energy use. The demand analysis included a separate research focus on rural and urban areas, and included considerations such as energy demand for small-scale agriculture, micro-enterprises and transport. The supply studies focused on fuelwood issues, the electricity industry, household hydrocarbon fuels, and cross-cutting studies focused on energy efficiency and the environment, pricing policies, human resources in the energy sector and investment requirements and financing mechanisms for the expansion of the energy system. A gender-based analysis of the development context of energy problems was added later by Amita Makan, one of the EPRET trainees.

This was significant in a number of respects. The structure of the EPRET project, emphasising demand, supply and cross-cutting issues, was repeated in a number of contexts, including the White Papers of South Africa and Namibia, and established a precedent for systematic energy policy analysis in South Africa. Energy efficiency was a new focus of research, pioneered primarily by Steve Thorne, and proved to be more important than previously thought.

- **The trainees**

Initially six, and later two more, of the EPRET trainees, were recruited by advertising and publicity events – Paul Theron, for instance, addressed the Wits Masters in Development and Public Policy class. Trainees included Mohammed Kamdar, Chris Lithole, Khibi Mabuse, Amita Makan, Godfrey Masanga and Sandile Tyatya. They were then put through an intense six-month course, involving daily seminars, on the energy sector, and then seconded to either EDRC projects or elsewhere, before being placed in the energy sector. One of the trainees was employed by the EDRC (Amita Makan), many of them worked in the MEPC and the DME afterwards, and a few worked in other parts of the energy sector.

- **Outcomes**

The project produced a number of policy recommendations. As well as ongoing workshops with stakeholders, a multimedia 'roadshow' was organised, which toured the country explaining these to stakeholders. Over 80 presentations were delivered to a vast range of players. While many researchers had been hoping for an immediate impact on energy policy, which was not forthcoming, the process established a widely-held consensus on goals for a new energy policy, which would be very significant in the policy processes of the next few years. The 'roadshows' also succeeded in inculcating a sense of urgency around electrification. It is interesting to see which policy recommendations were absorbed into the policy process, and which ones were not. In the 1994 Report, five categories were identified into which policies could be grouped. These were:

1. The accelerated national electrification programme
2. The low-smoke coal programme
3. The fuelwood scarcity programme
4. The paraffin and gas programme
5. The energy efficiency and demand side management programme

Of these, electricity was the strongest, and the most influential in the policy process. The fuelwood programme never really saw the light of day, possibly because it straddled government departments, but also because of the political economy of fuelwood use (see above). The liquid fuels sector has proved largely impervious to change, and low-smoke coal is still the subject of ongoing research, mainly relating to implementation. The last group of policies, energy efficiency and demand side management, are currently attracting significant interest again. Electrification, however, appeared at the time to have the potential to address most of the other sectoral concerns by reducing dependence on coal, wood, illuminating paraffin and gas; this has not proved as straightforward as was thought, and fuel choice and use in low-income houses proved to be a much more complex process. Electrification would not have the immediate effect initially supposed. Nevertheless, one of the most significant aspects of the project was the emphasis on electrification. Key studies on the electricity distribution sector, as well as studies on financing, framed the debate, fed into Eskom projects, and provided the framework for the ANC's Reconstruction and Development Programme's electrification section, which in turn set industry targets. This was the first time that the financial sustainability of potential electrification programmes had been accurately modelled, which helped to set the electrification programme in motion. Another central achievement was the establishment of what would become a broad framework for post-apartheid energy policy. Eberhard recalls that:

> "..the EPRET project first came up with the three E's.. ..social equity, economic competitiveness, and environmental sustainability as primary goals of energy policy [in South Africa].. ..I remember sitting down at tea-time once and saying we needed some bigger unifying picture, some framework within which to place EPRET, and through access to international literature, we came

> up with these, and that's pretty much provided the language of current energy policy in a way" (Interview with Anton Eberhard)

This internationally-recognised framework is significant in two ways; firstly, it established a new normative framework for thinking about energy policy in South Africa, replacing the old technocratic model. This in turn facilitates an understanding of the complexity of policy choices, which cannot be resolved by technical means; instead the terrain for the political choices that need to be made is mapped out. Apart from the electrification work, this was probably the most long-lasting impact of EPRET: the appropriation of this international framework and its contextualisation in the South African energy sector, which established an overall set of policy objectives which are now widely accepted in the sector.

- **Changing the organisation**

The EPRET project involved a change of gear for the EDRC. In a very short period it had virtually doubled in size, and became a much more diverse organisation. The project created a momentum that led to a sustained research programme across the energy sector. Politically, during the EPRET project the EDRC began to "engage explicitly with stakeholders". During the 80s, according to Eberhard, he and other researchers had always been ambitious about organising national conferences, but

> "had never engaged in an explicitly political way around stakeholders, but we built that explicitly into the design of the EPRET project.. ..workshops were held where we went away as a team with a whole group of people from the sector as well, for weekends, thrashed through issues, talked about early ideas that we had. It was a different style of research, there was a lot of research in progress that was exposed, both to fellow researchers and to stakeholders, and created I think an extraordinary opportunity for people to learn." (Interview with Anton Eberhard)

And people did learn; EPRET was very significant in attracting a range of people into the research environment, and equipping them to be good researchers. At the same time it gave a generation of researchers a sense of what was possible in terms of policy research, and raised questions about capacity-building in the energy sector. What also became clear was that gender issues were not part of the conceptual framework of the Project, and in fact were absent from the EDRC's work as a whole, which prompted Amita Makan to write what became Paper No 3: *A gendered perspective of the development context for energy planning in South Africa*. The household was the basic unit of energy demand analysis, but what went on inside the household was of key significance to any policy developments which might impact on poor households. Studies had shown that men and women used energy in different ways and had different priorities for household expenditure, both facts being related to domestic power relationships (Makan 1994).

- **The role of associates**

Increasingly during and after the EPRET project, the EDRC began to make use of a loose structure of researchers who at one time had been associated with the EDRC. Projects frequently made use of researchers who were not physically present in the EDRC or who were not EDRC employees. In addition, projects were and are often bid for by the EDRC in co-operation with other research groups and consultancies. Associates also play other vital roles in the organisation. Hilton Trollip, for instance, has been extensively involved in teaching and supervision of students in the EDRC's Masters course. Another associate who has played a significant role in the organisation is Anthony Williams, who has been involved in a wide range of EDRC projects in southern African countries. Another associate, Bruce Dickson, also continued to assist the EDRC in the management of large and complex research projects.

The establishment of the MEPC

During 1993 and 1994, Eberhard and Theron conceived of a policy research unit that would work directly with government, to be placed between the EDRC and the political realm. The aim of this organisation would be to fulfil an advocacy role, utilising political connections to place research done by organisations such as the EDRC in the policy process, thus leaving the EDRC to preserve its status as a research organisation. It was felt that there was a need for a policy group which would be independent, but close to the ANC, and based in Gauteng, close to the headquarters of the major players in the energy sector as well as the DME. It happened that Paul Jourdan, from the ANC's Department of Economic Policy, was attempting to set up a policy centre to work on minerals policy, and had been engaging with the same funder that Eberhard and Theron had approached. As the same government department covers both energy and minerals, efforts were combined. This coincided with the visit of the Dutch Minister of Development Aid, who agreed to fund the establishment of the new centre, which was established at a rather turbulent point in a turbulent period. . It so happened that the ANC was about to become the new government, and the staff and contents of Shell House, their pre-election headquarters, were moving to Pretoria. Large numbers of researchers and administrative assistants were employed by Jourdan and Theron; a combination of people from the ANC's Department of Economic Policy who did not have or want positions in the new government, and an odd assortment of people from the mining houses of Johannesburg, as well as a few researchers from the EDRC who had relocated to Johannesburg. Cyril Ramaphosa[10] was persuaded to chair the board, which lent some stability and credibility to the new organisation. This was all transpiring in the general political melee that occurred while the ANC was assembling the first democratic government in the country's history. The organisation went through a series of abrupt leadership changes, but has continued to work in partnership with the EDRC. The EPRET trainee programme was replicated in the MEPC, as well as aspects of the Green and White Paper processes, and a support programme for the PPC on minerals and energy, which was subcontracted to the EDRC. Since then the MEPC and EDRC have collaborated on a number of projects, the latest ones being the NORAD-funded petroleum policy project and a project to recommend ways of improving access by low-income households to LPG and paraffin

• The energy section of the RDP and electricity targets

The ANC's Reconstruction and Development Programme had a unique place in the policy process in South Africa in the 90s. It was the only comprehensive policy statement from the new government, and as such it fulfilled some of the functions of policy, that is, providing players in the political and economic arena with parameters for future governance. As it turns out, getting an energy section into the RDP was a crucial strategic move; in it was contained the blueprint for the electrification programme, one of the few areas where original service delivery targets have been reached and surpassed. Eberhard, Clive van Horen, Grové Steyn, and Mark Pickering contributed in one way or another. Mark Pickering went to RDP workshop after RDP workshop, to argue the importance of an electricity section. It was agreed, and the section was written one evening. It was based largely on work done by Clive van Horen and Grové Steyn, in the EPRET project, who had modelled the costs of different electrification scenarios. These figures were used to negotiate the RDP target with Eskom before the election:

> "If the ANC had not had that source available to it, of what the EDRC was able to provide in terms of policy thinking, Eskom could have negotiated a completely different figure.. ..outside a boardroom, somewhere in the north,

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[10] Secretary-General of the National Union of Mineworkers, and one of the key ANC negotiators in the lead-up to the 1994 elections.

> the Siemens building, Billy Cobbet, John Bradbury and some other senior Eskom managers, and they were saying 'OK, what's the target going to be? Oh, we're thinking something like this', and Billy said, 'two-and-a-half million' and they said 'Oh, ok'". (Interview with Mark Pickering)

This was the basis of electrification policy, which was negotiated and implemented largely outside government, and has really been the framework for development in this area until now, when the Minister is considering setting up a National Electrification Co-ordinating Committee.

- **Electricity advocacy**

During the same period, the EDRC was very involved in the National Electrification Forum, on a number of working groups, including Regulatory Framework, Structure and Policy (Grové Steyn), Financing and Tariffs (Anton Eberhard and Clive van Horen), the Electricity Supply Industry (Hilton Trollip) and End Use and Efficiency (Steve Thorne). The Centre was also involved in the setting up of the National Electricity Regulator; years later, Anton Eberhard was appointed to the board.

The Energy Policy Discussion Document and the White Paper

- **First steps**

It became clear in the early 90s that national energy policy was due to change considerably after 1994. The DME realised this, and had begun a long slow process of commissioning 13 'synthesis studies' covering various aspects of the energy sector. The idea was to survey research on various aspects of energy policy and then synthesise this into a 'discussion document'. Politically, however, things had moved on. A new Government of National Unity had been created, and according to the interim constitution, a certain number of cabinet posts had to be filled by member of the opposition, which was now the old ruling party, the National Party. The ANC had decided that the portfolio of Minerals and Energy would be one of these, and Pik Botha, the former Foreign Minister of long standing, was appointed. Botha had no desire to oversee a process of transformation in the energy sector; besides his ideological objections to dismantling some of the aspects of the apartheid energy system, his ministerial style was distant, and the only part of his portfolio he seemed to identify with was the international oil business, which involved a certain nostalgia for his previous role in government. This situation created an unique tension between the Minister and the Parliamentary Portfolio Committee, which was dominated by ANC MPs, and an adversarial relationship soon developed between them. The PPC began to assume the role of an ANC pressure group, trying to push the Minister into taking action. Politically, this situation crystallised around the issue of a White Paper. Botha did not really have any interest in a White Paper, but the PPC saw this as the only way in which policy could be transformed in the energy sector. This was a view supported by many researchers in the EDRC, some of which were on the ANC's Minerals and Energy Group. In the end, Marcel Golding, PPC chairperson, eventually called a meeting between the DME, represented by Johann Basson, the EDRC and the PPC, and told the DME on behalf of the PPC that they would shortly be receiving a proposal from the EDRC to manage the production of an 'Energy Policy Discussion Document'. It was envisaged that this process would lead within a short time to the publication of this Discussion Document, after which a consultation process would be undertaken aimed at producing a White Paper. This process would be a much longer one than expected. The EDRC was commissioned to produce the document at the end of 1994. Hilton Trollip was named in the contract as the project leader; he was in the process of moving from

the EDRC to the MEPC, but remained an EDRC Associate. The project was effectively run by a group of researchers from the EDRC and MEPC, including Trollip, Mark Pickering, Sarah Ward, Anton Eberhard, Wrenelle Ruiters and Grové Steyn, and the committee which drove the process was chaired by Johann Basson from the DME. It was an unusual mix of people; Basson was in a very difficult position, having to deal with an unwilling DME with no political support from the Minister on the one hand, and the completely unknown world of ANC politics on the other. As a result, the DME depended quite heavily on the EDRC contingent in navigating this world, and for a concomitant knowledge of democratic political processes, which were outside the experience of government bureaucrats of the time. (interview with Mark Pickering)

The format of the Document was very different from the original conception of the DME's. The problem was simple: the DME's 'synthesis' process was not representative at all of the views of the left, that had emerged from the negotiating forums (NELF, etc.) and projects such as the EDRC's EPRET project. A way had to be found to accommodate often contradictory views on policy in certain sectors, and so a structure was adopted that outlined the issues in a particular sector, and then presented a number of options, which encompassed both existing policies and options stemming from the EDRC's policy research and the ANC's RDP. Trollip outlined the situation:

> "It was clear that there was a wide gulf between the goals of the EDRC and those of Eskom, the DMEA and the oil companies. We realised that without political backing there would be no resolution. We presented the issues in an analytical way, presenting what were reasonable options, and created scope to include two sides of the spectrum. In the process we developed the strength of the parliamentary portfolio committee and left the choice until later. EDRC had the say over the analysis and the GNU was coming to an end." (Quoted in James 1999)

Politically, two things were happening. The first was that an opposition was being created between the old and the new policy frameworks; while it was necessary for the process to have an analytical veneer, this was really a battle about the values which would decide policy, and it was hoped that the alternative policy choices would be made in the wake of the collapse of the Government of National Unity.

This initial process was not consultative. The aim of the Document was to establish a scope and focus for a debate that would stem from its public release, as the first step in producing a White Paper. The Document was published and distributed after a delay of a few months caused by uncertainty about a preface by the Minister, for public discussion. The Discussion Document was labelled a 'Green Paper', to indicate clearly that it would shortly be followed by a White Paper.

• The White Paper process

The management of the White Paper process was once again contracted to the EDRC, in two phases. The first was a 'consultation and writing' phase, where a process would be put in place to set up forums where stakeholders would be consulted, and the Discussion Document would be widely distributed to elicit public reaction. A number of high-level meetings would be held with stakeholders, leading to a public National Energy Summit, at which attempts would be made to reach consensus on goals for the sector. The second phase of the process was a 'production and approval' process, which turned out to take a few years longer than expected. Researchers from the EDRC and MEPC involved included Anton Eberhard, Mark Pickering, Hilton Trollip, Grové Steyn, who wrote the electricity section, and Wrenelle Ruiters, who wrote the human resources section as well as designing the consultation processes.

The consultation process was unprecedented in the South African energy sector. The process began with a workshop for the PPC and DME, and followed by a

meeting with heads of relevant institutions in the energy sector to discuss governance, which was held in October 1995. Another workshop was planned, for 'small energy users', to give people at the other end of the spectrum a voice in the process, prior to a National Energy Summit. The Women's Energy Group objected to the process leading up to the summit on two counts; the process seemed to exclude women, and WEG considered one workshop inadequate to encapsulate the needs of 'small energy users'. Eventually Wendy Annecke (not yet at the EDRC) was invited by the DME to address some of the gender concerns, and the Energy and Development Group was contracted to run a much more sophisticated process, which also involved some EDRC researchers, to involve constituencies which would not normally have the capacity to participate in such a policy process. The process was not politically representative, and involved a cross-section of people which the EDG and WEG thought should be represented. Information was also disseminated through radio and the print media, and the process did contribute to the energy summit, but it was not clear in the end that the process had produced the desired results, which were to involve communities in the policy process that lacked the capacity to be involved by themselves.

The Energy Summit was partly held to elicit political commitment to the process by the Minister. The Minister did attend, and the process crawled forward. So-called 'straw dogs', positions on each subsector, were discussed at the Summit, and the ensuing process was collated by issue rapporteurs for the production of a draft White Paper. In December, Mark Pickering proposed an editorial process which would end with publication in March 1996, but it was not to be. The process was delayed, and in June 1996, the National Party pulled out of the Government of National Unity, which led to the appointment of an ANC Minister of Minerals and Energy, which slowed down the process further. The new Minister and a head of the energy division in the department were uneasy about the relationships that the EDRC had built up with the 'old guard' at the DME; the Minister was also keen to appoint new senior civil servants, which he did. The result was that the process was delayed even further while the Minister and his advisors acquainted themselves with the process and the White Paper as it stood.

The EDRC organised an 'Energy Policy Colloquium' at the end of 1997, to which stakeholders were invited, in an attempt to resolve the impasse. The new Minister, Penuell Maduna's priorities were affirmative action in the Department, and black empowerment (which had not been on the policy agenda up to then) in the energy sector, particularly in the liquid fuels sector, rather than the White Paper. He did not attend the Colloquium, which as a result did not achieve quite the desired effect. The draft White Paper had been held up by the newly-appointed Deputy Director-General, Gordon Sibiya. After his departure the Director-General, Sandile Nogxina, and his deputy, Smunda Mokoena, facilitated its draft publication.

The White Paper however, was finally published in draft form in July 1998, after which public hearings were held under the auspices of the PPC, and the final document was published at the end of 1998. The two major intellectual impacts that EDRC research achieved (besides a growing insight into designing policy processes) was the overall framework (social equity, economic efficiency and environmental sustainability) and the electricity section, largely written by Grové Steyn and influenced by other researchers such as Anton Eberhard and Clive van Horen. Johann Basson, who had chaired the process on behalf of the DME until his resignation, commented that the 'language' of the new policy framework was a central EDRC/MEPC contribution. Even though the project was run by a committee of DME staff and others, "the brunt of the detail was written by the EDRC/MEPC component" (Interview with Johann Basson). This framework set energy policy formulation and practice on a completely new footing. Even though the White Paper has been criticised for being heavy on ideas and light on specifics, the framework itself has shifted the goalposts in the energy sector, in that major players such as Eskom are positioning themselves in terms of these goals. In this

sense, the White Paper created the conditions for the development of effective post-apartheid energy policy.

Support for the Parliamentary Portfolio Committee

The EDRC's relationship with the PPC began in 1994, after South Africa' first democratic elections. Initially, it was on an informal basis, and centred on the Green and White Paper processes. Hilton Trollip and others worked extensively with the new MPs, briefing them on the energy sector and in some cases, writing speeches. This period, from 1994 to 1996, was characterised by an oppositional relationship between the Minister (Pik Botha at the time) and the PPC, which often emerged in open debate in parliament[11]. The PPC thus played an unusual role in making policy and pressurising a reluctant Minister into engaging with some of the pressing issues dominating policy debate in the energy sector at the time. This relationship changed when an ANC Minister was appointed, and the EDRC's support was put on a more formal footing: a support project was set up collaboratively with the MEPC and funded by NORAD. Another strand of this support process was the continued involvement and interest of Wrenelle Ruiters in training and capacity-building in the energy sector. Subsequent to her involvement in the EPRET trainee programme, Ruiters had obtained funding to set up a similar programme at the MEPC, from which evolved the Minerals and Energy Education and Training Institute (MEETI), which offers short courses to professionals in the energy sector, including DME staff, researchers and MPs. Several EDRC researchers and associates have been involved in this project, including Hilton Trollip, who teaches a course on petroleum. MEETI, together with the EDRC, also give presentations on energy sector issues to the PPC.

The PPC work was carried out by Joe Bryan, who had previously worked in an environmental NGO in New York. His work was built on by Fay Shabodien, whose role, based in the Energy, Markets and Governance programme, includes preparing briefings on current proceedings in the PPC, monitoring the passage of legislation, and co-ordinating expert input from the EDRC or elsewhere, where necessary. She also contributes to the structuring of new research in the EDRC in terms of what is taking place in the policy arena, which assists researchers to target research needs in the sector. She is currently working on an enhanced support project, which, as well as current functions, will set up and maintain an information system for the PPC, which will allow PPC members to access a wide range of current information on the energy sector, including up-to-the-minute research, as well as provide a monthly Minerals and Energy Policy Briefing outlining key policy issues in the minerals and energy sectors.

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[11] It is recorded in Hansard that Botha referred to Golding as a 'gollywog' on being interrupted during a speech. On being challenged, he amended the reference to 'jack-in-the-box'.

SOCIAL

Aiming to make a difference through approaching energy use as a social relationship and critically assessing ways in which these relationships can be transformed

After EPRET, the EDRC's research focus, providing energy to low-income households, diversified somewhat. A new approach to energy research developed, based on social research methods, emphasising qualitative surveys, and the social relationships that determined energy use. This approach had been pioneered outside the EDRC by a number of women researchers with feminist backgrounds, which is why I have included the Women's Energy Group in this section; this method of approaching household energy use revealed that gender relationships inside households had a major impact on energy use, which had not been revealed by previous research methods. Social research methods also engaged with power relationships within communities, and the possible impacts of, for instance, electrification, on these relationships, and vice versa. Both these factors had extremely significant implications for policy formulation.

An aspect of this kind of research was a more participatory approach. Research regularly featured workshops with communities where energy issues were debated and questions answered, either as part of the research or as a form of feedback. It became clear that there were other social factors that determined the effectiveness of energy programmes and policy, such as the form of the relationship between Eskom and local communities; local capacity, organisational forms and power relationships turned out to have a major impact on the outcome of energy-related projects. This type of research also opened up a new area of intervention at a more local level: this, and the heritage of the RAPS programme, resulted in the CAREDA programme, a new departure for the EDRC into implementation.

The formation of the Energy, Poverty and Development programme

After EPRET, an Energy and Urban Development programme was formed, led by Amita Makan, and later Mongameli Mehlwana, which initially continued *The analysis of new electrification schemes* project started a few years before, and was for a short period the home of the *Social determinants of energy use* project. A complementary Energy and Rural Development programme was established at the same time, which, embarked on a three-year research programme titled *The role of electricity in the integrated provision of energy to rural areas*. Both these research programmes, as well as the Energy Database Systems programme, led by Yaw Afrane-Okese (see Technical section, above), were combined in the 1996 reorganisation into a new programme called Energy, Poverty and Development. Afrane-Okese later moved to the Energy, Efficiency and Environment programme after completing the database work in 1998. Wendy Annecke was appointed in 1997 as programme leader. Annecke had completed a Masters thesis in 1992 in Women's Studies, which was a qualitative study of domestic fuel use by poor women in the peri-urban areas of Durban, based on work she had done in this area as an activist in the late 80s and early 90s. The Energy, Poverty and Development programme consolidated research on what was the EDRC's traditional domain: energy provision for low-income households, and absorbed the two main long-term projects in this area (*The analysis of new electrification schemes* and *The role of electricity in the integrated provision of energy to rural areas*), as well as contributing this expertise to other research programmes,

including national energy policy work based in the EMG programme (Mehlwana and James), and social research aspects of the 'E4' project (Mehlwana).

- **The Women's Energy Group**

The Women's Energy Group was a network of women from a wide variety of backgrounds, including parliamentarians, researchers and women from poor rural areas, concerned with energy issues. It was initiated by Rita Mfenyane, who co-ordinated WEG on a voluntary basis, having been given some space by the EDRC, which became the network's *de facto* base. They took up a range of issues, mainly concerning the lack of women professionals in the energy sector (virtual absence of women in traditional energy sector professions such as engineering), the marginalisation of 'small' energy users in the policy process, and the apparent absence of gender issues in the energy policy process. WEG became a significant focus in the EDRC for a number of concerns. Amongst these was the concern to establish the significance of gender in household energy use, particularly in the policy process. In the process of raising these issues it seemed that there was a relationship between content of research and the identity of the researcher;

> "The interesting thing for me is that there is not necessarily always a link made between broader representation issues and the content of the work.." (Interview with Bronwyn James)

This was an issue of intellectual content, in other words a question about what ought to be researched, but at a deeper level, also a critical consideration of how judgements were made about what was worth studying, who should make judgements about how to focus intellectual resources, and what the provenance of evaluative standards for intellectual work was. This implied a critical reappraisal of the relationship between power structures within a Centre such as the EDRC, and research content, quality and output, as well as the relationship between the social origins of researchers and the content of their research and research interests; it was possible that affirmative action policies would affect not only the demographic profile of the EDRC but also the intellectual content of research. There was also a sense amongst women researchers that male researchers had abandoned "soft" issues in the energy sector in favour of much more high-flying research involving economic and political issues. This translated into a political focus in two different directions. The first was a concern with transforming the EDRC from a "white male" organisation into one which was more representative; WEG members played an important part in the process which led to an affirmative action policy being put in place in the EDRC, as well as setting in motion a process of examining decision-making and management structures.

The second was a concern with the policy process. WEG's resources were limited in this regard, and so two areas were focused on: household energy and human resources: "Both were areas in which broad acceptance of the importance of taking account of gender in analysis and policy existed" (James 1999). WEG was also involved in trying to broaden access to the 1995 Energy Summit; there was a process in place to represent the views of 'small' energy users, but many felt that this was inadequate, and an expanded process of consultation was put in place by WEG and the EDG. WEG also played an advocacy role in relation to the Energy budget, lobbying for a Women's Energy Budget.

- **Focusing on the social aspects of energy use**

The formation of an Energy and Urban Development research programme in the wake of EPRET heralded a new approach to energy policy research. The analysis of new electrification schemes was continued, but with a difference. Phase III of the study was designed slightly differently, in that the questionnaire was designed to "focus on the end-user's perspective on how and why particular fuel/appliance combinations are chosen to fulfil energy services" (Annual Report 1994). Phase IV of the project, according to the Annual Report, was to have a "qualitative

dimension" and would "explore, for example, the ways in which gender and power relations affect fuel and appliance use" (ibid.). Instead, however, these research interests were channelled into a three-year nation-wide longitudinal study funded by the DME, titled *The social determinants of energy use in low-income households*. The research was being undertaken simultaneously in four different areas of the country by different organisations, co-ordinated by Professor Caroline White, an anthropologist at the University of Natal. The aim was to determine the social context of energy use in low-income households using in-depth qualitative methods of participative research derived from social anthropology. This was the first time that such an approach had been used in urban areas in South Africa, although the approach was built on work that had been done previously in the energy sector (mainly focused on rural or peri-urban areas) by Wendy Annecke, Fiona Ross and Bronwyn James. (Interview with Mongameli Mehlwana). The EDRC's section of the project, focused on the Western Cape, was initially led by Amita Makan, until she left in 1995, when this role was assumed by Mongameli Mehlwana. Mehlwana joined the EDRC in 1995 to work on the project; he was completing his Masters in anthropology at the time. Nomawethu Qase joined the EDRC at the same time to work on the project; she had a background in sociology and human resources. Almost all the work on the project was done by these two researchers (Amita Makan was involved in the initial planning and research phase, and another researcher, Samkelo Blom, was involved in the second phase).

The project itself was completed in two phases: phase one ran from 1995 to 1996, and phase two from 1996 to 1998. The methodology of the study was a departure from previous surveys of energy use in South Africa in a number of ways. Traditionally, surveys had been questionnaire-based and quantitative in nature, the idea being to determine what kind of energy was used by households and how much of it. *Why* this was the case had never been explored in depth,[12] but was now of great concern to policymakers. Simple assumptions had been made in the past about the way in which low-income energy users moved from one source of energy to another, but these had often not been borne out in experience. It was vital to explore these questions, as the answers would have very significant ramifications for policy. The first phase consisted of a study of 60 households of different housing types, and came up with some very significant results not produced by previous surveys. A review of the result of this phase of the research concluded that:

> "The final reports from all four areas provided a measure of detail and insight not usually available from questionnaire surveys and therefore, we suggest, provided a more productive vehicle for generating useful policy recommendations as a result of their anthropological method.. ..The value of anthropological research lies precisely in its holistic understanding of the contexts in which people act. This does require a level of intensity of research not adopted in any other discipline. Our results so far suggest that this approach, despite its labour intensity, is extraordinarily productive.." (Mehlwana 1996)

The second phase was much more wide-ranging, both in the focus of research and the range of interactions with the subject communities and the energy policy process. The aims of this phase, as well as recording household energy consumption patterns, monitoring fuel-switching patterns and decision-making about energy sources, had two innovative goals:

> "to discover the processes through which end-users can participate in decision-making on energy-related matters, [and] to create feedback between

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12 Although some studies had been done using these methods (James, Annecke et al.), these had focused on small areas – this study was significant partly because of its scale, longitudinal nature and the distribution of its subjects, which built up a national picture.

> policymakers and users to refine policies and work towards the generation and implementation of appropriate policies and technology." (ibid.)

Thus the project aimed not only to do research, but to investigate innovative mechanisms for the involvement of low-income energy users in the policy process. This happened in several ways. Workshops were held with communities in which the results of research were presented, and community concerns about energy discussed. Another report which emerged from this process, titled *Knowledge is power: Empowering households with energy information*, produced by Mehlwana, Qase and Samkelo Blom, explored the process of holding these workshops more thoroughly and evaluated several different approaches. Policy monitoring was another important aspect of the project; electrification and initiatives such as child-proof paraffin lids were evaluated to establish their grassroots impact and inform policy modification.

Research focused not only on households, but on broader community energy uses such as micro-enterprises, as well as the effects of energy use, such as fire and health impacts.

The research had several foci. A central focus was multiple fuel use and fuel substitution. The orthodox theory of 'transitional fuels', whereby users migrate from 'traditional fuels' (e.g. wood) via 'transitional fuels' (e.g. paraffin) to 'modern fuels' (e.g. electricity) as their income increases (on which many of the assumptions underlying electrification policy were based), was critically assessed, and a much more complex picture emerged of the actual practice of low-income fuel users. Fuel use was found to be influenced by a range of other factors such as fluctuating income, physical availability of energy sources, gender and generational dynamics, and cultural perceptions about different fuels sources. It emerged from this study, for instance, that there was a considerable population living in backyard shacks in electrified areas, who had no access to electricity, even though electricity was available on site; this specific problem was not being addressed by electrification strategies at the time, even though it involved a significant number of households; this was partly because these households were invisible to normal planning processes. Another focus was decision-making, both the budgetary aspects of decision-making (one of the reasons for paraffin use, for instance, was that it could be bought in small quantities, and sometimes on credit from spaza shops, even though it is a relatively expensive fuel), and the social dynamics of the decision-making process within the household, an aspect of energy use that was normally ignored by economic analyses. Theories about appliance acquisition (a vital aspect of energy use) had previously assumed that this process was related to income and gender dynamics within households; research showed that while income and gender had a significant influence, these were not the only factors; some appliances have multiple uses, and appliances often have social-symbolic and aesthetic functions not directly related to their energy use. The project also undertook analyses of the relationships between domestic activity and energy use, including a correlation between energy use and time of day (which has major significance for growth in peak load and thus investment in generation capacity if houses are electrified) and a study of the relationship between income, fuel use, cooking patterns and nutrition. Additional studies were also undertaken on energy efficiency of dwellings, safety factors involved in different forms of energy, and the relationship between fire ("one of the most powerful and significant social forces in the township" (ibid.)) and energy use.

A significant area of research was energy-use by micro-enterprises, which is being taken further by Nomawethu Qase in current research towards a Masters degree, titled *Energy services, gender and the informal sector: A case study of Gugulethu informal meat traders*.

The outcomes of the project were very significant in policy terms, and informed the energy White Paper and significantly restructured the ongoing policy debates on energy provision for low-income households and communities in urban areas. The use of qualitative research methods was also influential in establishing a more complex understanding of the relationship between the policy process and research, and opening up a new and essential dimension of energy problems to research, which have informed research practices in other EDRC programmes.

- **The rural electrification project**

A number of disparate studies concerned with rural energy demand were broadly grouped into a research programme called Energy and Rural Development in 1994. The research programme gained a more coherent focus a year later, when a very wide-ranging three-year research contract was awarded, funded by the DME, NORAD and Eskom to research the financial, institutional, social and economic aspects of rural electrification. The project was incorporated into the Energy, Poverty and Development programme when the EDRC was restructured at the end of 1996.

Cecile Thom, who had an Honours degree in physics from Stellenbosch and had done the Masters course in energy and development was appointed project manager. She had previously completed a paper on energy and rural development in the EPRET project. Two new researchers, Bronwyn James and Pamela Ntutela, were appointed. James had done ground-breaking research on rural energy in Natal, and had pioneered the use of qualitative research methods in researching rural energy needs by living in a community for a couple of months; she was appointed research manager for the project.

The study had originally been initiated by Grové Steyn, and was aimed specifically at producing a detailed policy framework for rural electrification. The project involved the preparation of 45 research reports and papers by EDRC researchers, associates and researchers from a range of other South African organisations. These were reviewed by an international group of South African and international rural electrification specialists, and the outcome was summarised into an EDRC publication titled *Rural Electrification in South Africa*. The design of the study is very interesting. It seamlessly integrates grid and off-grid electrification, and considers, besides the more usual studies such as programme financing, a comprehensive survey of rural energy demand, examining the potential demand for / impact of electricity in relation to water supply, small-scale agriculture, education, health, small, medium and micro-enterprises, as well as considering different supply options and tariff structures.

Two relatively new areas of research for energy policy analysis appear in the Research Summary under the sections entitled *Building human capacity through delivering electricity to rural areas* and *Community-based organisations for operation, maintenance and administration in rural electrification*. The former research, consisting of a report by Bronwyn James, proposes a process-orientated model for implementing electrification projects in rural areas:

> "While most engineers and technical experts understand electrification as a technical process.. ..there is growing recognition within Eskom that the success of their electrification projects is most often not dependent on whether the technology performs adequately, but on how rural people interact with that technology.. ..factors originally considered to be irrelevant to engineers, such as the social organisation.. ..have been show to be relevant." (Rural Electrification in South Africa, EDRC, 1998)

Electrification has an impact of existing social networks and power relationships in rural communities, and education programmes on electricity have to be understood in this context. The latter study examined the role of Community Based Organisations in the electrification process, and some of the shortcomings of

current approaches. Both foci illustrate a trend to considering non-technical aspects of energy as part of a policy analysis exercise, as well as emphasising engagement with communities at a local level. James saw a disjuncture between this kind of engagement and the national policy process:

> "I have great difficulty reconciling the tension between the need for absolute certainty and broad generalised understandings which are required for policy work with the complexity and diversity of the lives of the people we are 'making policy for'. For me, this disjuncture clearly exists at an intellectual level – how do you reconcile the in-depth textured understanding that arises from anthropological-type research with the bland policy statements that appear in policy documents? We as policy 'experts' feel that 'we'll just do this and then x will happen' - but, it's so clear that this causal understanding doesn't necessarily hold true... development interventions which flow from policies will always be negotiated and re-shaped." (Interview with Bronwyn James)

The project had originally been designed as a much more policy-oriented project, but James and Thom had attempted to change its structure to engage more with issues at the implementation end of the process ("Looking at things which might guide Eskom's practice and approach in communities" (ibid.)). The end result is a creative accommodation of these two tendencies, drawing on the experience of a number of researchers with different skills from different research programmes, including Douglas Banks, Mark Davis, Gillian Simmonds and Clive van Horen. Research included more traditional aspects of policy research such as financing, as well as an emphasis on the *process* of electrification. For instance, Cecile Thom, in a report titled *Pre-electrification research in Mafefe: Energy use, livelihoods, power relations and the electrification process*, undertook a complex analysis of a range of social, economic, political and institutional factors to understand the potential impact of electrification, which included the technical scope of the project, power relationships in the community, the form of institutional interaction between Eskom and the local community, existing energy use, and current and future potential energy-linked and non-energy-linked economic activity. This approach aimed to match real development goals with specific strategies such as electrification; in a sense it is an approach that focuses on the other end of the policy process from a White Paper; whereas the latter lays out a political framework and powerful symbolic goals to mobilise resources, this kind of research interrogates the effects of this kind of power at a local level, and critically examines the social relationships that definitively shape interventions. In this context, criteria for measuring policy success become much more complex and multi-factorial. This project demonstrated two emerging trends in the EDRC research process; the articulation of a wide range of policy analysis skills, and associated with this, outcomes of research involve a much more complex set of interventions, from local community/utility interaction to institutional factors and national policy goals.

- **Recent and current projects**

These projects built a wide range of expertise on the social, organisational and institutional aspects of energy provision to low-income households and communities, which was deployed in a variety of contexts in 1998 and 1999. Mongameli Mehlwana developed a capacity-building process and accompanying educational materials for rural communities in pilot electrified sites, and evaluated Eskom's community consultation and education initiatives in this regard. Mehlwana and Douglas Banks completed a project to determine a basis for comparing the benefits of various rural energy applications in different contexts, which drew on similar work in relation to appliances in urban areas as part of the *Social Determinants* project. Mehlwana and Mark Davis also undertook an evaluation of the management and implementation of the Pamdozi electrification project in Zambia. As an outcome of the rural electrification project, Cecile Thom and Nthabiseng Mohlakoana are currently undertaking an evaluation of the

impacts of electrification in rural areas in the Northern Province for Eskom. The research is based on case studies and will last for two years.

A three-year project which will support energy service providers in their attempts to provide affordable and safe access to paraffin and LPG to significantly more poor urban and rural communities is just beginning. The project will be managed by Nomawethu Qase, and will also involve Mongameli Mehlwana, Yaw Afrane-Okese, Njeri Wamukonya and Anton Eberhard, as well as several researchers from the MEPC.

From RAPS to CAREDA

At the end of 1996, the EDRC was reorganised again, and the number of research programmes was cut down to three, which meant that the RAPS programme was effectively abolished. The remaining work was relocated to the Energy Efficiency and Environment programme, where a few researchers continued their work on 'renewables', for a short time.

During the RAPS programme, EDRC had organised a regional workshop to assess the need for establishing a network of organisations supporting applications of renewable energy in Southern and East Africa. This wider dissemination and consolidation of expertise in the region was an idea supported by UNIDO; it was considered as a possible forward path for the RAPS programme, but although considerable interest was shown by several agencies and government energy departments, the initiative did not take root.

Meanwhile, researchers in the RAPS programme were still concerned that there was a gap between the policies and efforts of rural energy delivery programmes and their practical implementation, delivering actual benefits to rural communities. This concern arose both through the RAPS programme's experience of working alongside solar electrification initiatives, as well as the broader experience with rural electrification gained through the EPD programme.

A useful role was foreseen for more intensive local-level assistance within rural communities, working together with local authorities, community organisations, NGOs and energy service suppliers, to try to facilitate a more integrated approach to energy service delivery. This would involve capacity support for local organisations, close liaison with energy supply agencies working in the area, and engagement with wider aspects of rural development planning. EDRC could act as a link between such local-level engagements and national agencies; in time, a regional network of organisations involved in similar project activities was envisaged.

After an interval of several months and some intense debate, Bill Cowan established the new programme Cooperative Assistance for Rural Energy and Development in Africa. This was a new departure for the EDRC, as the programme fulfils some functions which are more typical of a development NGO than a university-based research organisation. The core project in the CAREDA programme is SEED (Sustainable Energy, Environment and Development), supported by Danish Cooperation for Environment and Development. SEED has two parts, an Urban SEED project, run by EDG, which focuses on sustainable energy in the context of housing developments for low-income communities in Durban, Cape Town and Gauteng; and a Rural SEED project, which operates in districts of Eastern Cape and Northern Province, run by EDRC. There are project partnerships with municipalities, housing NGOs, Danish NGOs, and rural development NGOs.

The Rural SEED project has two EDRC rural SEED facilitators, Thomas Phooko and Boyce Plaatjies, who are working together with the Environmental Development Agency Trust, based in Pietersburg and Matatiele respectively. Their

roles include finding out about local energy-related needs and the opportunities for improved energy supply and use; assisting local development forums and district planners to engage with energy suppliers; facilitating better coordination among different service suppliers; and helping to spread information. EDRC staff provide back-up and liaise between local, provincial and national role-players. The aim is to facilitate better methods of supplying and using energy in the selected rural pilot districts, and then to communicate these to other communities, local and provincial government, and national agencies. As well as providing capacity support to local organisations, the project is designed to provide feedback to energy policy and strategies, based on practical experiences over time.

CAREDA is intended to be a cross-cutting programme, drawing in EDRC staff from other programmes. From the EPD programme, key roles have been played by Mongameli Mehlwana and Bronwyn James, in addition to CAREDA staff Bill Cowan, Douglas Banks, Patrick van Sleight (the SEED media officer) and the SEED Danish programme advisor René Karottki.

Douglas Banks recently moved from EDRC to take a position in a rural energy company, carrying forward a commitment to the idea that rural energy services need concerted efforts by private sector suppliers and through private-public partnerships.

The first phase of the SEED project is scheduled to continue into 2001, with possible extension to a second phase, in which it is hoped that further regional linkages will be established among rural energy projects of a similar nature. Regional cooperation contacts are presently being explored in Zimbabwe, Lesotho and Mozambique. However, in the first phase, attention focuses on the challenges within South Africa.

ENVIRONMENTAL / EFFICIENCY

Aiming to make a difference by integrating environmental and efficiency issues into all levels of energy policy and planning

This research focus began during EPRET with two papers, *Household energy and environment* by Clive van Horen, and *Energy efficiency and conservation*, by Steve Thorne. Thorne was a chemical engineer by training and had done some work on new electrification schemes in the EDRC before EPRET, and the latter study was concerned with the benefits of efficiency, both to low-income consumers and to the national economy. Clive van Horen's study established a new focus for environmental concerns. Previously,

> "Most public and policy attention directed at the South African energy-environment interface has been concerned with the macro-environmental impacts of coal-based electricity generation, acid precipitation, and increasingly, global climate change " (Van Horen, 1994)

There had been a few limited studies done by the CSIR on air pollution in Soweto from coal smoke. However, a comprehensive overview of energy-linked environmental problems experienced by low-income households had not been undertaken. These included air pollution from coal and wood fires, which significantly increases the risk of respiratory illness, paraffin poisoning from accidental ingestion of paraffin amongst children, burns and house fires from candles, paraffin stoves, open fires and gas appliances, and problems related to fuelwood scarcity in rural areas. The paper analysed the social and economic costs of these problems and made a number of policy recommendations, ranging from low-smoke coal to child-resistant paraffin bottle lids. The lines of inquiry begun in this broad-ranging study were taken up in different EDRC programmes: the issues of health and safety were researched in the Social Determinants and Rural Electrification studies. The Energy, Efficiency and Environment programme, however, which developed from these two studies, developed a policy-orientated synthesis between low-income household energy use, environmental factors and energy efficiency which emerged from a three-year project begun in 1994. In addition, van Horen completed a PhD thesis on externalities in the electricity sector (parts of which were published as *Counting the social costs: Electricity and externalities in South Africa*, UCT Press 1996) which used a number of sophisticated economic models to estimate the social costs of coal and nuclear electricity generation. This work was also the basis of work done by Van Horen for the Industrial Strategy project at the EDRC in 1996 on the environmental costs of electricity supply. Van Horen's PhD work is still the only study of its kind in South Africa. Van Horen also later applied this analytical framework, in partnership with Norconsult, to a Mossgas expansion project.

Energy efficiency and environment

The initial programme was distilled out of EPRET project research in 1994, and was headed by Clive van Horen. The main project that the Programme worked on for the first three years was a study titled *Energy efficiency, equity and the environment: widening access to energy services for the urban poor of South Africa*, which was funded by the IDRC and Eskom, and developed by Steve Thorne. Various researchers contributed individual studies, including Thorne, Nisa Mammon, Gillian Simmonds (later the project manager, after Steve Thorne left), Khibi Mabuse (from the MEPC), Mark Borchers (from EDG), and Alix Clark (who joined the EDRC in 1997). The aim of the project was to develop a sound

understanding for the role of energy efficiency in provision of energy services to low-income households, and the potential environmental impacts. Energy efficiency programmes could effectively "supply" energy more cheaply than traditional options; in order to assess this potential, a sound understanding of the economics of various potential interventions was necessary. On this basis, environmental factors could also be considered. Thus the study's main aim was:

> "to identify policies and strategy interventions which could improve the appropriateness and efficiency of energy services in a way that addresses both the energy poverty and the energy-related environmental problems experienced by the urban poor.." (Simmonds and Clark, 1998)

Low-income households generally expend more resources (money, or time/labour in fuel gathering) for the same energy service than middle or high-income households; for instance, per unit of light, candles or paraffin cost more than electric lighting. Choice of fuels is limited by financial factors (the cost of the fuels themselves as well as the cost of appliances) and structural factors (for instance, not being connected to the grid). "Low-income households thus rely on a range of relatively expensive, but inefficient and unsafe fuels to meet their energy needs" (ibid.) In addition, many of these energy sources pose potential health risks; for instance, respiratory illness from coal smoke, burns from fires, or paraffin poisoning from accidental ingestion. Energy efficiency measures would lower costs to poor households as well as having advantages to utilities by reducing bad debt and variable load factors. The problem is that low-income users are usually less likely to invest in energy-efficient infrastructure (such as roof insulation or more efficient appliances) because of lack of capital, and that often the cost of less efficient energy sources such as paraffin does not reflect the full economic cost (as externalities are not factored in).

The project had a number of objectives, including the determination of the prospects for improved end-use efficiency in poor households and the availability of energy-efficient technologies in South Africa and barriers to their use by poor households, and to develop a "programme of energy-efficient strategies for specific application to urban poor households" (ibid.). In addition, the team assessed the environmental impacts of energy efficiency, both on a micro level (local effects, e.g. coal smoke) and a macro level (greenhouse gas emissions). Methodologically, the project moved through four phases. The first was to examine international and local experience in energy efficiency, and the second was to identify potential areas for intervention in the household sector through a quantitative assessment of energy use patterns in the low income urban sector. The 3rd phase honed the project's scope down to four areas, namely fuel switching, energy-efficient lighting, thermally-efficient housing and energy-efficient appliances. Studies that came out of these foci included studies on energy-efficient lighting by Alix Clark, a study of financial (cost to consumer) and economic (full cost to society) costs of different household energy services by Steven Thorne and studies on energy-efficient housing by Gillian Simmonds. Khibi Mabuse, who was seconded from the MEPC, did some work on appliance labelling, and Mark Borchers did research on fuel switching. The early environmental work , which interested IDRC, was reported in a study by Gillian Simmonds and Ian Marchal, a Masters student, titled *Environmental effects of improved household energy efficiency*. In parallel, Spalding-Fecher and Barbara Praetorius (a visiting researcher and PhD candidate from Germany) looked specifically at the climate change mitigation potential of energy efficiency strategies for low-income households in *Greenhouse Gas Impacts of DSM: Emission reduction through energy efficiency interventions in low income urban households*. The study ranked energy efficiency strategies according to impact on greenhouse gas emissions; while immediate impacts based on current consumption would be low, if one factors in avoided growth in demand, the reductions would be significant, and even more significant if one extended the analysis to the entire household sector.

The two funders of the project, Eskom and the IDRC, were interested in different aspects of the study. Two final reports were produced to address these needs. The first one, referred to above (*Energy Strategies for the Urban Poor* by Alix Clark and Gillian Simmonds) focused on Eskom's interests in the project, which were concerned with:

> "..enabling low-income households to choose the best fuel mix for their needs, as well as enhancing thermal, appliance and lighting efficiency in households." (Clark and Simmonds 1998)

The report synthesised a large number of strategies aimed at removing barriers to low-income households choosing the best fuel mix for their needs. A number of recommendations were made concerning the roles of the DME and Eskom, as well as a potential Energy Efficiency Agency, an appliance labelling programme, developing and disseminating information about energy and thermal efficiency and safety, and setting up energy advice centres. A second report was authored by Spalding-Fecher, focused on the IDRC's environmental concerns. This work, titled *The real costs of conserving energy: Energy efficiency in low-income households*, dealt with the economic benefits of investment in energy efficiency, included the avoided 'external costs' from reducing household fuel consumption while raising service levels. Following additional research and modelling of the economics of energy efficiency, these two reports were synthesised into a further report, titled *Energy Efficiency for the urban poor: economics, environmental impacts and policy implications*, jointly authored by Spalding-Fecher, Clark, Simmonds and Mark Davis. The report noted that:

> "International experience shows that energy efficiency is often the most effective means of meeting service demand. In countries where the gap between access to affordable energy and the demand for clean energy is very large, such as South Africa, energy efficiency therefore has the potential to accomplish multiple social and economic objectives.. ..The analysis presented in this report demonstrates the substantial economic and environmental benefits from energy efficiency interventions for the urban poor." (Spalding-Fecher, Clark, Simmonds and Davis 1999)

The report makes a strong case for the economic and social advantages of energy efficiency; however, there are barriers, which are analysed as follows: consumers often lack information, a situation exacerbated by a relatively low rate of literacy; energy efficiency often requires consumer investment, which, even though economical in the long run, requires initial capital which low-income houses often do not have; efficient fuels are often not available (for example, unelectrified houses); there are no clear incentives to build energy-efficient housing, which is more expensive for contractors, but much cheaper for residents; appliances are often acquired for symbolic value as well as use value, which might militate against smaller, more efficient appliances. A number of remedies are proposed, including policy interventions (including the setting up of a National Energy Efficiency Agency), changing the regulatory structure of the electricity industry to reward energy efficiency investment and practice, and re-examining the role of electricity distributors.

The E4 project inaugurated a new process of research. Previously, researchers had been contracted to complete work, then compile a report, which was then sent to the client, where the outcome of the research was utilised to a greater or lesser extent. Much of the E4 project, by contrast, happened interactively; results were communicated to Eskom and other stakeholders on an ongoing basis, and research agendas adjusted to fit evolving requirements. This process established extensive contact with Eskom staff, which had not existed before, which has meant that the project planning and funding process has become much more precise and efficient. Alix Clark's energy-efficient lighting work, for instance, has led to an invitation to join Eskom's Energy-Efficient Lighting Working Group as an advisor.

Supported by a large grant from the Global Environmental Facility, administered by the International Finance Corporation, this group will oversee the planning and implementation of the first major residential energy efficiency investment by the electricity sector in South Africa. Moreover this Efficient Lighting Initiative will have as its major focus reaching the low income sector with energy efficient lighting, a testament to the years of effort to raise these issues to the fore in Eskom's demand side management planning. The research project on Demand Side Management currently being undertaken by the Energy Markets and Governance programme is another legacy of the E4 project.

From household to global

The reorganisation of the EDRC at the end of 1996 and the appointment of a new programme leader, led to a shift in focus, from research on household issues to more engagement with policy mechanisms at a national and multilateral level, looking for creative ways to link global climate change policy debates and funding mechanisms to low-income household issues and structural change in the electricity supply industry. An early project of this sort was undertaken by Nisa Mammon, Gillian Simmonds and Clive van Horen, as part of the Southern African Energy and Environment Programme, to examine the environmental impacts of significant growth in regional energy trade, in collaboration with three other energy-environment research centres in the Southern African region.

Randall Spalding-Fecher was appointed as programme leader in mid-1997, with a background in management, international environmental policy and environmental economics. When he arrived, there was considerable debate about an effective focus for the programme. In the restructuring process, the EEE programme was still engaged in the "E4" project, and had inherited a technical-economic project from the RAPS programme (hybrid systems as applied to RDP projects in rural areas). One of the areas of debate was whether to focus on energy-efficient/renewable technologies, but it was decided that this role could be better played by other research organisations in the energy sector:

> "..we definitely did make a strategic decision that that we wouldn't focus on the technical side – it's not where we're going to try to build strength. Our strength would be in policy, in linking environmental energy policy issues, in some economics, and also understanding of the international policy environment. One of the outcomes of that decision is that we can link important development issues to policy in the energy sector. For example, there'd be almost no institutions [in South Africa] that would have an entire programme dealing with the links between energy, development and climate change; there are individuals.. ..and in that sense, we're in quite a unique position, to have a whole research programme that links environmental policy, and climate change as a subset of those issues, to other energy development issues.. ..if our group were in the United States, our work would be quite different, because there energy and environment means emissions reductions – rather than facilitating the development process, providing people with homes and jobs, but at the same time reducing local and global pollution." (Interview with Randall Spalding-Fecher)

Innovative connections between low-income urban households, energy efficiency and climate change are being explored. The programme will monitor a low-income energy-efficient housing programme that is a model for a South Africa project that is a 'pilot phase' international climate change initiative (i.e. an "Activities Implemented Jointly"), "but the monitoring work itself will be very traditional EDRC work" (ibid.,) involving qualitative and quantitative research methods; "we are linking some of those more traditional social research methods..

..in this case for a climate change case study project" (ibid.). Household work has also shifted from basic research to consultancy and advocacy;

> "..now what we are doing are not so much research tasks as liasing with the regulator or we help prepare a presentation for somebody from Eskom to make an argument to their board to push this with government. At the same time, we are taking a new look at current policy-relevant projects like off-grid electrification – at their potential local and global environmental benefits." (ibid.)

As the debate on the Clean Development Mechanism (a project-based system to trading 'Northern' investment for 'Southern' carbon credits under the Kyoto Protocol) heats up, the programme is tackling both the international policy debate – publishing a number of conference papers and chapters in international publications – and how it links to local energy development issues. Even the low smoke fuel initiative, one of the main recommendations coming out of the EPRET era, is beginning to bear fruit, and EEE staff are engaging the DME programme.

Another emerging area of research is regional electricity development and the environment. The entry of South Africa into the Southern African Development Community opened up vast opportunities for regional co-operation in energy, particularly to replace some of the 'dirty' coal-generated electricity in South Africa, Zimbabwe and Botswana, with hydro and gas-based electricity from Namibia, Mozambique, Zambia, Angola and even the Democratic Republic of Congo. The EDRC held a training workshop in 1998, funded by the German foundation CDG, for utility and government planners from the SADC region to introduce a more integrated planning framework for the region.

> "..how can you apply an integrated energy planning review to the regional electricity market, and what are the environmental benefits and economic benefits of that. That's kind of an emerging theme in the programme." (ibid.)

Support for the SADC Energy Sector TAU and ongoing engagement with the National Electricity Regulator, and Yaw Afrane-Okese's participation on the NER Integrated Resource Planning Task Team continue to support this policy debate on regional co-operation. Afrane-Okese, who joined the programme at the beginning of 1999, will build on his thesis research on integrated energy planning to support potential future research on local, as well as regional, integrated planning issues.

- **The World Wildlife Fund Electricity and Environment paper**

The programme's environmental economics theme continues in a current research project on macroeconomic and environmental interactions in relation to the electricity industry in South Africa. The research is part of a broader WWF Macroeconomic Programme Office project in Southern Africa. Spalding-Fecher and Khorommbi Matibe, who joined the programme in early 1998, will examine the environmental impacts of electricity production, building on the earlier work of Clive van Horen and bringing this up to date, as well as considering under-researched areas such as the environmental benefits of electrification. This information will be used to estimate current external costs of the industry. Afrane-Okese will also analyse mitigation options, looking at how Eskom's longer range plans could be made more environmentally friendly, and how much that would cost. The paper will also address the implications for the electricity sector from the move to more cost reflective water pricing. Even though Eskom has pioneered 'dry-cooling' technology for its power stations, which have significantly reduced water use, water is still a significant factor in electricity production in South Africa, and changes in water pricing structures could have an impact on the economics of electricity generation, and might impact on future supply choice. At the same time, Mark Davis will be looking at the impact of distribution restructuring on end-user prices, and how that compares with environmental issues. Finally, with assistance from Conrad Barbeton, a research associate at the Applied Fiscal Research Centre

at UCT, the project will examine the restructuring of the electricity generation and distribution industries in South Africa, and the impact this will have on environmental governance and pricing structures.

- **Climate change policy analysis, capacity-building and mitigation analysis**

When government began a process of ratifying the UN Climate Change Convention in the aftermath of the 1992 Rio 'Earth Summit', NGOs took exception to the lack of public consultation, and a process to accommodate stakeholders was set in motion. Clive van Horen, programme leader of the Energy, Efficiency and Environment programme at the time, was instrumental in setting up the National Committee on Climate Change, which advises the Department of Environment Affairs and Tourism (DEAT), and consists of major stakeholders including industry, unions and NGOs. The committee is an important forum to provide advice to government on what are important and potentially controversial issues related to climate change. Although DEAT is the lead department for climate change, other key departments also participate in the NCCC and an interdepartmental committee on climate change.

The Activities Implemented Jointly (AIJ) policy research project in early 1998 was funded by the HSRC programme on Global Change and Social Transformation, Eskom and the US-South Africa Binational Commission, and was one of the early climate change policy projects for the EEE programme. AIJ refers to:

> "projects or policies undertaken collaboratively among countries to mitigate the threat of climate change within the scope of the United Nations Framework Convention on Climate Change." (Spalding-Fecher and Hirst 1998)

The objects of the project were "to support South African stakeholders in their efforts to understand risks and opportunities of AIJ, and to develop strategies to manage them" (ibid.). The research process included workshops with stakeholders, NGOs, civic organisations, and the National Committee on Climate Change, and a framework was for implementation that set a number of policy criteria to ensure that projects furthered the goals of national development and climate change policy, as well as recommending a number of institutional changes.

This was followed by a major project to support government dealing with policy issues on international mechanisms such as AIJ and the more recent 'Clean Development Mechanism'. The current project, funded by Norway through DEAT, is entitled *Monitoring, capacity building and decision-making support for Government on flexible mechanisms under the Framework Convention on Climate Change,* and provides support to government on understanding key policy issues and international negotiations such as the recent sessions in Buenos Aires in November 1998 and the recent Bonn negotiations. The project has also produced research on a number of topics related to the Clean Development Mechanism and the relevance of other multilateral climate change mechanisms to South Africa, as well as identifying capacity building needs in key government departments to respond to the opportunities and threats in the climate change convention. Gillian Simmonds managed this project until her departure in mid-1999, when this and other climate change work was handed over to Njeri Wamukonya, a new project manager who joined the EDRC in May 1999. Khorommbi Matibe also worked on the project throughout, playing a particular role with Wamukonya in the monitoring side – monitoring an actual energy efficient housing project for both global impacts (reduced greenhouse gas emissions) and local impacts (perceptions of the community).

The EEE has also supported the Parliamentary Portfolio Committee for Environmental Affairs and Tourism on climate change issues, as well as other local energy and environmental problems, and the PPC for Minerals and Energy Affairs

on a range of local, regional and global energy and environment policy issues. This including presentations and submissions on the Draft Energy White Paper and the Climate Change Discussion Document.

Lwazikazi Tyani is a new researcher in the EEE programme; she is currently completing her Masters thesis on the impacts of the Electricity Distribution Industry restructuring on Demand Side Management, with particular attention to impact on potential energy efficiency measures.

GOVERNANCE / INSTITUTIONAL

Aiming to make a difference through engaging with stakeholders and government around the relationship between the structure of the energy sector and the policy goals of government

A focus on institutional aspects and governance of the energy sector began to develop in the EDRC when researchers started to explore the question of energy provision for low-income households in urban and peri-urban areas. It was clear that the lack of electricity provision to these households was almost wholly an outcome of the institutional structure of the energy sector under apartheid. If the way that the electricity sector was structured was part of the reason for lack of electrification in urban areas, what sort of institutional arrangements would best facilitate electrification? This line of inquiry was broadened considerably during the EPRET project. Studies were completed on the electricity distribution sector (Grové Steyn), investment and financing (Clive van Horen), pricing policy (Mark Pickering) and an historical study (Robert Horwitz) on the development of the institutional and regulatory structure of the South African electricity industry, and policy debates concerning its future. EPRET also raised questions about the relationship between the larger economy, the energy sector and low-income households, and one study (Hovei and Dahl) examined Southern African linkages in the sector. The policy framework that developed out of EPRET (equity, economic efficiency and environmental sustainability), led to a more multi-dimensional focus on institutional questions in the energy sector. After 1994, work on institutions and governance developed two foci. The first was the electricity sector and some studies of other sectors, such as gas and the nuclear sector. The second was a focus on policy processes. These foci were grouped into two research programmes in 1995, namely 'Energy industry restructuring and governance' and 'Strategic and economic studies'. The former dealt with sectoral research, such as electrification, and the latter with the South African and other national policy programmes, as well as regional institutional questions (SADC). In 1997, these two programmes were consolidated into the Energy Markets and Governance programme. Grové Steyn, was one of the driving forces behind the formation of the Energy, Markets and Governance programme:

> "In some ways it was probably the first formal recognition of a new area of research that had opened up. This had earlier emerged with my participation in the Structure and Governance working group at NELF and our interest in regulation, and my participation in the establishment of the NER.. ..it soon became evident that the energy sector would have to experience wide-ranging institutional restructuring. We were interested in this and thought that there was a need for independent expert policy research. In many ways this probably departed from the "technology for development" and "rural and urban poverty" roots of the EDRC.. ..It did, however, have the potential to form a productive relationship with the other new programme, Environment and Energy Efficiency."(Grové Steyn – personal communication)

This broader focus was very significant. It marked the final phase in a transition within the EDRC from a research group focused on 'energy for development' issues as a small part of national energy policy to a research group focused on national energy policy as a whole in the context of the equity, economic efficiency

and environmental sustainability framework[13]. As the heady days of the 1994 election passed and the energy White Paper process set the broad parameters for new policy, a new sort of engagement with the policy process ensued. The White Paper process operated in two contexts. The first was the transition from an apartheid energy sector to a post-apartheid one, which was the major concern of the transitional phase of government. The second context was the global context, the increasing importance of environmental factors, and the very significant changes that were taking place in other energy markets around the world. These changes mainly relate to governance and the structure of markets; in the case of liquid fuels, deregulation, and in the case of electricity and gas, the creation of markets in the place of what were thought to be natural monopolies, and the establishment of complex regulatory regimes. In South Africa, the relationship between these changes and government commitments to supply energy services to the poor, improve economic efficiency and mitigate environmental impacts, is of pivotal importance; these kind of questions began to inform the policy debate in the South African energy sector more centrally as political attention shifts from managing the transition to concerns of governance more characteristic of a stable democracy. This shift was accompanied by a shift in the nature of the EDRC's relationship with government and the policy process. After the 1994 elections and the appointment of an ANC minister to the Minerals and Energy portfolio, policymaking shifted into a more orthodox institutional setting, and the focus of the EDRC's involvement shifted from a more partisan role as an advocate of a new energy policy framework, to a focus on supporting high-quality policymaking through research and support for the policy process. A new consensus was established around the White Paper in the energy sector; there are two questions remaining: what form should the policy process take in order to guarantee high-quality policymaking in a South African environment, and what sorts of institutional reform are necessary to achieve broad policy goals in the energy sector? These questions form the core of the EDRC's research on institutional and governance questions.

- **Initial work**

The experience of working with consultants from other countries during the EPRET project, as well as some work done for the Macro-Economic Research Group (an economic policy unit which did some work on possible directions for post-apartheid economic policy), led to a broader vision within the EDRC. Concerns with institutional questions were also beginning to arise in the RAPS work, as technical research programmes drew to a close and the question of implementation arose. Some work was done on the Nuclear sector, and Hilton Trollip initiated a study of regional policy and institutional frameworks for natural gas in view of a potential South African market opening up, in collaboration with the Technical and Administrative Unit of the SADC Energy Sector in Luanda, in collaboration with Norconsult and NORAD. He also undertook another study titled *Governance and institutional requirements for natural gas development in Southern Africa* for the SADC, which included negotiating a new trade in gas with Mozambique. The most sustained sectoral focus, however, remained, and remains, electricity. There were two aspects to this: the first was consulting, which included a range of studies, both in South African and elsewhere, and the second was support for and engagement with the policy process that set up a National Electricity Regulator. EDRC researchers, particularly Grové Steyn, Anton Eberhard, Clive van Horen, Hilton Trollip and Steve Thorne, were very involved in the National

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13 One of the researchers associated with the EDRC for the last decade who epitomises this development is Mark Davis: he started off conducting research on combustibility of different indigenous wood types and PV pumping, wrote his PhD on electrification and institutional reform, and is now doing work on energy markets in the EU in Scandinavia.

Electrification Forum (NELF), as well as being closely involved in setting up the NER.

Research on electrification was carried out under the auspices of a predecessor to the Energy Markets and Governance programme, the "energy industry restructuring and governance" programme. Mark Davis, Grové Steyn and Mark Pickering carried out a "national electrification planning project" for the DME, Eskom, NER and DBSA, in collaboration with the MEPC, which "investigated current electrification planning practice in South Africa and developed policy proposals to improve the efficiency and equity of the resource allocation process in this programme" (Annual Report 1995/6). The study was focused around the process of restructuring the electricity distribution industry. Mark Davis also carried out two studies on electrification in neighbouring states. The first was an assessment of electrification in Ovamboland in Namibia. The problem was that due to the dispersed settlement patterns, electricity distribution was not necessarily financially viable, and under the existing tariff structure, it was not. However an economic analysis revealed that it was economically viable, as large numbers of small diesel generators had and would be replaced. The problem was thus finding appropriate institutional arrangements to render the programme sustainable. The second study was on rural electrification planning in Swaziland. The project drew up criteria to decide which areas to electrify, as well as assisting in the development of policy, and proposing financial and institutional arrangements for the programme.

The EDRC's institutional focus was enhanced by an increasing involvement in policy processes and governance issues. Involvement in consulting in the region led to an increasing interest in policy frameworks in other SADC countries. An EDRC team, consisting of Hilton Trollip, Clive van Horen, Anton Eberhard, and Grové Steyn, were part of a team led by Mark Borchers of the EDG (who in turn had been contracted by the Botswana Department of Energy and the consultants GTZ) to facilitate a consultation process. The German group GTZ had completed a policy-formulation process aimed at producing a "Botswana Energy Master Plan". The role of the EDRC/EDG team was to design and implement a process aimed at involving stakeholders in the Botswana energy sector in the process.

A study was undertaken in 1996 for the Technical and Administrative Unit of the SADC Energy Sector entitled *SADC Energy co-operation policy and strategy*, which examined ways in which the SADC Energy Protocol (which specifies regional co-operation on energy provision and harmonisation of national policy in the region) could be implemented. Four areas were identified: improved information dissemination and exchange, improved co-ordination in energy trade (particularly electricity), co-operation in investment policy, training and capacity building, and the improvement of institutional and managerial capacity. The study was undertaken by Anton Eberhard and a team of international researchers and SADC TAU staff, and was the start of an abiding interest at the EDRC in research on regional electricity planning and policy.

The EDRC had two separate involvements in the Mozambican energy sector. The first was inspired by the EPRET project, and the second later project involved national policy work (see below). Anthony Williams, an EDRC associate, had lived and worked in Mozambique, and had developed extensive contacts in the energy sector. While he was working on the EPRET project, some researchers from Eduardo Modlane University in Maputo visited, and made a request that the EDRC help them set up a similar project in Maputo. The eventual project ran for about 18 months from 1996 to 1997, and involved regular visits from Williams and Hilton Trollip, and occasionally other researchers to Mozambique, as well as Mozambican researchers spending time at the EDRC for extended training and capacity-building sessions. The project was successful in establishing a solid local capacity in household energy policy research.

In the mid 1990s, the DME commissioned a study from the EDRC, which was done by Mark Pickering and Anthony Werkman to do a comparative analysis of government energy departments in different countries. The aim was to correlate their capacity with the size and character of their energy sectors, to get a sense of the appropriate capacity, by world standards, of the South African department. Even given the inevitable inaccuracy of a comparative study of this kind, it was clear that the South African DME was very underresourced. This was partly a deliberate strategy on the part of the apartheid state; due to the secretive nature of the energy sector during apartheid, the energy policy and regulatory branch of government had either never developed, or when it did (as in the NEC) it had not been sustained. Thus raised interesting questions about the policy process, which were further explored by the involvement of EDRC policy researchers in other SADC countries.

The development of an Energy, Markets and Governance programme

The Energy, Markets and Governance programme emerged out of the restructuring exercise that the EDRC went through towards the end of 1996. Anton Eberhard assumed the position of acting programme leader until Alix Clark accepted the position in 1999. Clark has a background in planning and economics; she moved from the Energy, Efficiency and Environment programme in 1998. When the programme was formed, it was the only research programme not explicitly focused on energy needs of low-income households:

> "[the EMG programme] was quite a radical step in EDRC's history, because it was not where our core was, it was not universally acknowledged, and there's still quite a tension between our poverty work and that." (Interview with Anton Eberhard)

The programme concentrates mainly on four areas: national energy policy, the electricity industry, the liquid fuels industry and to a lesser extent the nuclear industry.

• National energy policy

The EDRC's formal involvement with national energy policy processes began with the Energy Policy Discussion Document, and continued with the South African energy White Paper (see *Policy/Political*, above), where the EDRC managed the process, as well as providing expert input. EDRC researchers have been involved in several other SADC countries' energy policy processes in the last three years. After the Botswana experience (see above), the EDRC, along with the consultancy Sadelec, was commissioned by the Mozambique Directorate of Energy to produce an Energy Strategy for the Mozambican energy sector, to provide a framework for planning and investment decisions in the country.

At the beginning of 1997, the EDRC was asked to be part of a team of consultants led by the MEPC who had been engaged by the Namibian Ministry of Mines and Energy to oversee a year-long process leading to the formulation of a White Paper. Ten "issue teams", consisting of Ministry of Mines and Energy staff, members of the consulting group and other experts, dealt with different aspects of the Namibian energy sector, undertaking research and consultation in these areas. An important aspect of the project was that this expert process ran concurrently with a public policy process, which consisted of three workshops held at significant stages of the expert process, as well as an invitation to comment on the draft policy once in White Paper form. Participation was open to a wide rage of stakeholders, from local authorities to the petroleum industry, and from the business sector to the donor community. The workshops were interspersed with a process of collation of the policy positions into a White Paper. This process clarified government aims

and strategies, while accommodating stakeholder concerns, providing a clear framework for future legislation and restructuring of the energy sector. Anton Eberhard, Alix Clark, Bill Cowan, Mongameli Mehlwana and Bronwyn James participated in this process.

The EDRC is currently involved in supporting the Lesotho Government in developing an updated energy policy framework, necessitated by uncertainty over the future of the national electricity utility as well as a need to update the previous policy framework, the Lesotho Energy Master Plan, drawn up in the mid 80s. The kinds of challenges the Lesotho energy sector faces are familiar to EDRC researchers; institutional issues related to the electricity industry, and providing energy services to low-income urban and rural households. The project will run for three years, and is funded by DANCED. The EDRC is part of a team of consultants, including Ramboll, Danish Power Consult, SADELEC and Sechaba Consultants, who are involved in the process. Bill Cowan was involved, through DANCED, in establishing the structure of the process, and Alix Clark, Mongameli Mehlwana and Anton Eberhard are now working in the project. The project has several phases; the first is the updating of the Master Plan; the second is the implementation of energy planning strategies, and the third will be the development of a framework for electricity sector monitoring and governance, which will be accompanied by a process of enhancing the performance and efficiency of the Lesotho Electricity Corporation as a supplier and distributor of electricity. An additional phase will examine the potential for wind energy in Lesotho. The process as a whole will also be a capacity-building exercise to develop policymaking capacity in the Lesotho Department of Mines and Energy.

Comparative reflection in the EDRC on these experiences in energy policy processes in the region has led to the evolution of a common framework for policymaking, unique to the social and political environment in southern Africa (characterised by significant numbers of poor energy users, many of which live in rural areas), emphasising a development-based approach to the energy sector with an emphasis on the demand side, and a strong sense of process and the importance of political ownership. This was codified in a project proposal to manage a policy process in Ghana. The process is conceived in terms of three elements of the policy process: political ownership (active involvement and commitment of relevant sections of the government), analytical content (research and analysis, as well as reliable data), and stakeholder representation (energy producers and consumers as well as other interested bodies from civil society such as NGOs). This conception of the process differs considerably from an orthodox conception of the policy process contained in the policy literature, in that one of the central tasks in the process is to build political consensus in the energy sector, thus avoiding some of the assumptions of policy theorists writing in a first world environment concerning the pre-existing capacity of civil society and the state to engage in successful policymaking and implementation. The other central aspect of the Energy, Markets and Governance programme's engagement with the policy process is the programme that provides support to the PPC on Minerals and Energy (see Policy/Political above).

- **Electricity**

The EDRC, in collaboration with Sadelec and a team of Namibian consulting engineers, assisted the Namibian Government in developing plans for restructuring the electricity supply industry, with particular attention to the restructuring of the distribution industry. A number of different scenarios were outlined, including regional distributors (the future South African model), private concessions, and the formation of 'stakeholder' distribution companies.

Alix Clark, the current Programme Leader, is currently completing an 18-month project for Eskom on what possible impacts the restructuring of the Electricity Supply Industry (ESI) could have on Demand Side Management (DSM)[14] investment by utilities, government or consumers. As the process of restructuring begins, both of the distribution system (which will shortly be rationalised from the current haphazard combination of local authorities and Eskom, with an equally complex tariff structure, into between five and nine large regional distributors), and possibly of the generation side as well, choices will have to be made; it is vital that as far as possible, these choices are informed by thorough research. The project includes an international review of the impact of ESI restructuring on DSM in countries which have already gone through this process, and an overview of current prospects for and barriers to DSM in South Africa. Following this, implications of different ownership and governance patterns for DSM will be explored, as well as the possible role of the regulator in facilitating DSM. In addition, the question of how restructuring might remove barriers to DSM will be explored, as well as regulatory systems that will ensure its survival, and funding mechanisms. What role Eskom can play in ensuring the survival of DSM will also be considered.

The project has been designed in two parts. The first part comprises the above research, and the second part comprises the presentation of the research findings to key industry stakeholders, as well as supporting the restructuring process through workshops and presentations to Eskom, the NER and government, as well as identifying and hosting international experts where necessary. The project is an example of an emerging paradigm of policy research in the EDRC; Clark comments that:

> "..our research has changed a lot. When I first arrived at the EDRC, when we were working on the E4 project, a lot of it was just working on it in the programme, a lot of research and nothing else; and it's moved very much away from that, you do a little research, and you communicate with the industry and the stakeholders, and you do a little bit more, so it's become a lot more interactive, so you don't get to a position where you've done research and it's not needed, or the needs in the industry have changed." (Interview with Alix Clark)

Projects of this type are changing the role of research in the policy process. Rather than being one input into a decision chain, a project of this sort supports the whole process in a very flexible way, providing a range of focused input where necessary, and altering research goals to adapt to the course of the process.

Justice Mavhungu is a new researcher in the programme, and is in the process of completing his Masters thesis. His thesis is on possible approaches to and impacts of subsidising electricity consumption for low-income households, with particular reference to the coming restructuring of the electricity distribution industry.

- **Liquid fuels**

The other project in the EMG programme at present is a multi-year petroleum policy project, funded by NORAD. The project involves a wide range of expertise situated in different locations, including the MEPC, but is managed by the EDRC on behalf of the DME; researchers based at the EDRC include, Auke Lont and Anton Eberhard, who are working on natural gas regulatory policy, as well as Hilton Trollip, who is on the project management committee. Two trainees are also working on the project at the EDRC: Jocelyn Muller is working on possible impacts of deregulation of the petroleum industry on wages, conditions and levels

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[14] Measures taken to reduce demand for electricity, usually as an alternative to increasing supply. These can take a number of forms, from reducing peak load to increasing end-use efficiency.

of employment, and Zoleka Xabendlini, who is working on an international comparison of the impacts of deregulation of petroleum sector, in the light of the likely deregulation of the sector in the next few years. The EMG programme hopes to build a strong capacity in petroleum policy research in the EDRC through involvement in the project.

- **Nuclear**

The EDRC's involvement in the nuclear sector began in the early 90s with some research on the future of the sector. Thomas auf der Heyde did a comprehensive review of the nuclear fuel cycle in South Africa in 1993, and the EDRC participated in a conference in 1994 on the future of the nuclear industry. Anton Eberhard was part of a team that undertook a thorough review of the Atomic Energy Corporation in 1997 on behalf of the Department of Arts, Culture, Science and Technology, with a view to considering the future importance of supporting nuclear technology research in the light of the large percentage of the annual Minerals and Energy budget that this sector consumes.

ORGANISATIONAL

Beginning in 1989, the EDRC grew from three people to over 25 in 1999, as well as a network of associates and a number of graduate students. During this time, the process of decision-making and management has evolved in response to a number of challenges. Over the years, the need for more complex management and support structures, the need to be a capacity-building as well as a research organisation, the need to accommodate diversity creatively, and the need for diversifying leadership and responsibility in the organisation, have engendered a process of organisational development and strategic planning culminating in the present complex decision and management structure. This has happened in several phases; the founding of the EDRC to 1994, during which time the EDRC was nominally overseen by a Steering Committee; 1994 to 1996, when attention was focused on decision-making and affirmative action; and 1996 to the present, during which a major restructuring exercise created the current research and management structure.

- **1989-94**

When the EDRC was established (initially as CRAET), one of the conditions of the National Energy Council was that it was overseen by a Steering Committee, which was to consist of representatives from the NEC, the Development Bank, Eskom, the ERI and UCT. The original purpose of the NEC involvement was to facilitate research on 'energy for development' issues, and the EDRC's increasing tendency to question the ways these issues were defined, caused tensions on two fronts. First, there was debate about what the respective roles of the ERI and EDRC were in energy policy research; the EDRC had ambitions that stretched beyond the narrow focus with which the organisation had begun; and secondly, the EDRC was seen increasingly by certain sections of the NEC/DMEA as being too close to the ANC, which caused significant tension within the Department at the time. Meetings of the Steering Committee were held every six months or so, and on an ad-hoc basis when necessary for briefings or project reports. These tensions are reflected in the minutes from time to time. The committee took particular exception to the *Research Outline* for the EPRET project; negative references to the effects of apartheid in connection with the development of the South African energy sector were seen to be a departure from 'objective research'. Other incidents also caused tension, such as the EDRC's involvement in the 1992 ANC electrification conference. The five-year core grant from initially the NEC and then the DMEA, was not renewed, and ran out in 1994. The EDRC took the opportunity to formally break away from the ERI, and the Steering Committee was abolished.

During this time, the organisation had grown considerably, mainly due to the EPRET project, and its support needs had too. More complex project structures and administrative demands made it necessary for more dedicated administrative staff. During this period, Pari Callias, the first administrative assistant at the EDRC, had been joined by Shireen Arnold, Cha Schaub, whose role developed into librarian of the fast-growing collection of books, papers, reports and other vital resources, Joan Collet, a bookkeeper, and Tim James and Eve Macnamara, who took on the demanding job of producing media for EDRC projects, which included editing, producing multimedia material, layout and design, and managing production processes of EDRC literature of various kinds; both of them also contributed significantly to the transformation processes in the EDRC. Eve Macnamara has since left the EDRC and Tim James is now solely responsible for media production.

- **1994-96**

1994 saw the confluence of three changes. These were firstly an expansion in the EDRC's role, from a narrower focus on "appropriate technology" issues and data collection on energy use in poor communities to a much broader and more high-profile role in the national policy process. Secondly, as apartheid receded and the first democratic non-racial government was elected, there was a growing awareness of the importance of affirmative action. Thirdly a change in what sort of research skills were useful. It was no longer true that an engineering background was essential in order to do policy research in the energy sector; the EDRC was beginning to employ research methods drawing on economics, social anthropology, sociology and human geography. In addition, administrative support and management structures, which had grown in a rather haphazard way up to and during the EPRET project, needed to be put on a more systematic footing. Decision-making processes, about project management, quality of output, human resources and organisation direction, were felt to be inadequate, and black and women staff felt alienated from what they felt was a white male organisational culture; the Women's Energy Group, based in the EDRC, played an important role in articulating some of these concerns. In addition, important decisions needed to be taken about the Centre's strategic direction; what research should be done, what the relationship between the new government and the Centre should be, and so forth.

A strategic planning process was set in motion. Wrenelle Ruiters, who had become the EDRC's de facto human resources manager by virtue of her background and her interest in and concern with the issues involved, project-managed the process. There were two strands to the process. On the one hand there were issues of transformation that needed to be addressed, and on the other hand, a process aimed at positioning the organisation strategically in terms of future projects and orientation. The part of the process was conducted on the basis of a model of intersecting spheres. The first of these was national priorities in the sector, the second was potential sources of funding for specific research, and the third consisted of the capacity and inclination of EDRC researchers. The aim of the process was to determine where these spheres intersected; in other words, where national needs coincided with possible funding for research and interests and capacity of researchers. This strategic planning process was repeated on a regular basis in the years following.

The results of the process were significant restructuring, and the introduction for the first time of proper decision-making and consultation processes within the organisation. Research activity was reorganised into seven research programmes, namely:

- Energy and Urban Development
- Energy and Rural Development
- the RAPS programme
- Energy, Efficiency and the Environment
- Electricity
- Energy Information and Planning Systems Research (later Energy Database Systems)
- Institutions, Human Resources and Employment Research

(Electricity and the Institutions, Human Resources and Employment Research were restructured the following year into two programmes called Energy Industry Restructuring and Governance and Strategic and Economic Studies.) Each of these programmes was headed by a programme leader; these programme leaders took on a wide variety of roles, including intellectual leadership, project design and funding, and sitting on a newly-constituted Management Committee, along with

the director, a Staff Development Co-ordinator, a support staff representative and a representative of "black and/or women staff" (EDRC strategic plan, 1994-6). The plan included a set of organisational goals, which were;

> "To study energy and development problems and needs in Southern Africa and possible ways to address these;
>
> To contribute to reconstruction and development through the achievement of improved social equity, economic efficiency/competitiveness and environmental sustainability in the energy sector;
>
> To develop human resources to respond adequately to energy and development needs." (ibid.)

A formal affirmative action policy was put in place, which specified employment practice as well as representation on EDRC structures, which was focused on recruiting, and if necessary, training, a much higher proportion of back researchers to the organisation; this was also an extension of one of the EDRC's goals, which was to build capacity in the energy sector, especially amongst previously disadvantaged groups. A wave of new black researchers which followed the implementation of the policy provided a valuable new perspective on the EDRC's work; many of them were more familiar with the communities at which most of the EDRC's work was targeted.

In addition the plan systematised a lot of other aspects of the day-to-day running of the EDRC, which were incorporated into the EDRC Manual, which is updated from time to time and now exists in electronic form on the Centre network. The role of the director began to change as well, and evolved into one of managing the interface between the research process and the political realm. This role included keeping contact with political role-players, negotiating big projects, and providing an overall strategic direction for the organisation. Additional support staff were recruited: Pari Callias had left the EDRC and Debbie Pieters joined the Centre as an administrative assistant. Julia Krone was appointed as a Contracts and Systems Officer, Michelle Patel was appointed as an assistant to Joan Collet, and the growing complexity of the computer network necessitated the appointment of Edward van Kuik to provide computer support.

- **1996-1999**

Some parts of the 1994 strategic plan were successful, and others less so. There was significant tension between the capacity-building aspirations of the Centre and the research structure, which was having an impact on the EDRC's affirmative action policies. As there was a shortage of highly-skilled black researchers, it was essential that the EDRC fulfil a capacity-building function; this in any case was an EDRC goal in the energy sector. However, there was little space in the organisation to do this; programme leaders had very little time due to tight project schedules, and in cases researchers inexperienced in the energy sector found themselves fulfilling these roles themselves, with little support. In addition, planned training schemes did not materialise for a number of reasons. Another problem was that power and responsibility in the organisation was still concentrated in the director; there was a feeling that the management committee could not make properly autonomous decisions. To deal with these problems, an 'organisational development' process was set up, consisting of a series of workshops where problems and frustrations were discussed, and solutions explored. A new strategic plan was produced for 1997 to 1999. In this document a number of failures are highlighted, including the realisation that "staff development" required dedicated resources, and that the earlier strategic plan had failed to devolve enough power and responsibility from the director. Solutions to these problems were implemented during 1997. Research programmes were reduced from seven to three (before the emergence of CAREDA), which had a number of advantages. Programmes were now large enough to provide support to new researchers, and

were more strategically focused on the EDRC's area of work: The structure of the research programmes mirrored the EDRC's goal of promoting social equity, economic efficiency and environmental sustainability in the three programmes:

- the Energy, Poverty and Development programme
- the Energy Efficiency and the Environment programme
- the Energy, Markets and Governance programme.

In addition, a taught Masters course was planned and reintroduced in 1998; Douglas Banks was very involved in initiating and convening the course, after which Mark Davis assumed this role; this was an important development for the energy sector as well as for the EDRC; quite a few promising black researchers have now completed the Masters course and are employed in research programmes under the apprenticeship of programme leaders.

A new management structure was put in place, including a full-time manager, a Human Resources Committee, a Co-ordinating Committee and a Finance Committee. Bev Gillespie was appointed as EDRC manager, and had played a very significant role ensuing the smooth running of the organisation and the smooth operation of management structures. The Finance committee has ensured complete transparency of financial matters within the organisation, and the Human Resources committee has developed and implemented a set of policies and mechanisms for recruitment and the proactive resolution of problems and disputes within the organisation. During this period there were significant changes in the management and support functions: Leigh-Ann Wentzel was appointed as a part-time finance assistant in 1997, Theresa Wathen was appointed in 1997 as an administrative assistant, and Ethney Waters replaced Cha Schaub as librarian in 1998. Gamieda Gierdien replaced Debbie Pieters, who left at the beginning of 1999. Geoff Crowe succeeded Edward van Kuik as IT manager, and was succeeded by Darren Ravens at the end of 1999. Shireen Arnold continued as PA to the director and as office manager.

The EDRC is in the process of transforming itself into a Section 21 company, and will retain its links with UCT through its post-graduate programme and membership of UCT's new Virtual Science Park, a structure which will act as a bridge between industry, government and university-based research units. This is part of a broader transformation within the university, as research units such as the EDRC undergo significant growth in contract research in areas which are non-core university activities. The EDRC ends the decade in a healthy financial situation and a multi-million rand investment reserve. The EDRC's high dependence on contract income means that it will have to continue to provide valued research products in a rapidly changing external environment if it is to remain financially viable. Another very significant change at the end of 1999 is that the founding director, Anton Eberhard, is stepping down, in order to focus on academic research and his institutional responsibilities in the energy sector. A decision is currently being taken on appointing a new director. At the end of a decade, the EDRC has succeeded in transforming its racial and gender composition – from being a predominantly white male organisation in the early 90s, it now has more black women than white men among its staff. Eberhard's role in strategically positioning the organisation, maintaining high-level networks, and opening new intellectual and policy avenues, will need to be replaced. The collective commitment of a new wave of (mostly) black researchers and a new director, inherit the foundations to do this, and to take new, as yet unforeseen directions.

CONCLUSION: EDRC AND THE POLICY PROCESS

The EDRC 1999 Strategic Plan states the following goals for the organisation:

> "EDRC seeks to be a leading-edge African energy policy research and capacity-building institution. In the achievement of this vision, EDRC is committed to:
>
> - undertaking research to deepen knowledge and understanding of the energy needs, problems and challenges in South Africa, and the rest of Africa, and innovative ways of responding to these;
> - contributing to transformation and improved social equity, economic efficiency and environmental sustainability in the energy sector through public-interest advocacy and through communicating knowledge and understanding as a resource for better policymaking and implementation; and
> - educating, training and developing people in the energy field."

These aims are the culmination of a development process going back 17 years, which took place against a backdrop of momentous changes in South Africa. In this development process, two things have emerged. The first is the EDRC's relationship to the policy process, and the second is the ability to find a balance in the organisation, in capacity and resources, to pursue these goals simultaneously. These things have emerged in response to a specific context, namely the South African energy sector, and as a result, they have certain characteristics.

The context is significant because the EDRC embodies some solutions to problems in a wide range of similar contexts in the South Africa and the developing world at large. In a nutshell the problem is a lack of policymaking capacity. This is a vicious circle in many ways: improving policymaking capacity usually requires policymaking itself; policymaking capacity requires stable democratic institutions, which require good policymaking; usually good policymaking requires efficiently-used resources, which requires good policymaking, and so forth. Models and conceptualisations of the policymaking process generally originate in the first world, where a range of assumptions are made about the underlying conditions that exist as a background to the policy process. These include well-resourced government departments, a readily-accessible pool of expertise, a stable democratic culture, well-developed institutions of civil society such as the press and stakeholders which articulate a complex set of interests, which inform the process. As some or all of these assumptions do not hold in developing countries, these models and conceptualisations are not always very useful, if at all. What is happening in South Africa is that new approaches to policymaking are being developed in practice, as part of a new political culture.

Insofar as the EDRC has evolved with the coming of democracy in South Africa, it forms part of this new political culture in the country. One of the significant features of this culture is the role played by research centres in the policy process, to strengthen the capacity of government, and to produce policymakers and analysts. The EDRC's work in energy policy has converged over the years on a specific approach, which involves the following characteristics. It is an inside-track approach, which involves working closely with government and stakeholders, having diversified contact with the energy sector at a number of points. It is aimed at reaching consensus with stakeholders and government on changes in the sector, partly by creating new policy options and frameworks through research, and the EDRC itself, unlike the orthodox conception of a policy research centre, is a political actor, whose goals are the "three e's"; social equity, economic efficiency and environmental sustainability. The overarching goal is to enhance the policy

process. The EDRC finds itself part of an energy policy community, which it has helped to bring into existence – in political terms, the EDRC's task is to maintain and extend this community by involving more stakeholders, creating more policy options through research, and enrich it through building new capacity in the energy sector. A new generation of researchers come into the organisation with different priorities from the generation that oversaw the transition. In the new millennium, the challenge will be to make the energy sector work as effectively as possible for the nation as a whole, which has never been achieved before in South Africa. This will require imaginatively building on the innovative work that the EDRC has already done in developing new approaches to the policy process.

GLOSSARY

3 e's – social equity, economic efficiency, environmental sustainability

AIJ – Activities Implemented Jointly

ANC – African National Congress, currently the governing party in South Africa

CAREDA – the Co-operative Assistance for Rural Energy and Development in Africa programme

DEAT – Department of Environmental Affairs and Tourism

DME – Department of Minerals and Energy

DMEA – Department of Mineral and Energy Affairs; an earlier name for the DME

E4 – the Energy Efficiency, Equity and the Environment project

EDRC – the Energy and Development Research Centre, based at the University of Cape Town

EEE – the Energy Efficiency and Environment programme

EMG – the Energy Markets and Governance programme

EPD – the Energy, Poverty and Development programme

EPRET – the South African Energy Policy Research and Training Project

ERI – Energy Research Institute at the University of Cape Town

Eskom – The South African state electricity parastatal

NEC – National Energy Council, which briefly replaced the energy branch of the Department of Minerals and Energy from 1988 to 1992; the NEC was better resourced and more autonomous than the energy branch

NER – National Electricity Regulator

NORAD – Norwegian Agency for Development Co-operation

OECD – Organisation for Economic Co-operation and Development

PPC – Parliamentary Portfolio Committee, consisting of a small representative selection of Members of Parliament whose task it is to review legislation and events in the energy sector on behalf of parliament

RAPS – Remote Area Power Supply

SADC – Southern African Development Community

Sasol – A company originally set up by the apartheid state to produce petroleum products from coal to counter the effects of the oil embargo against South Africa in the 1970s and 80s, partially privatised in 1979

SEED – the Sustainable Energy, Environment and Development project

UCT – University of Cape Town

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EDRC OCCASIONAL PAPER

Making a difference

Reflections on the first ten years of the Energy and Development Research Centre at the University of Cape Town

ANDREW MARQUARD