UNIVERSITEIT VAN PRETORIA
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Graduate School of
Technology Management

# ENERGY SYSTEMS ANALYSIS GROUP

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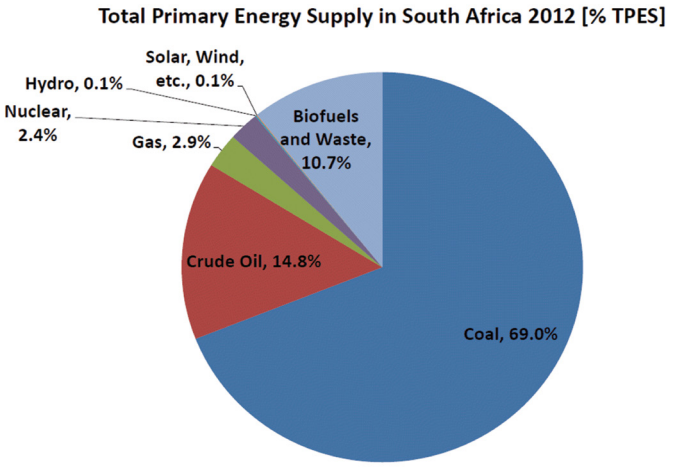
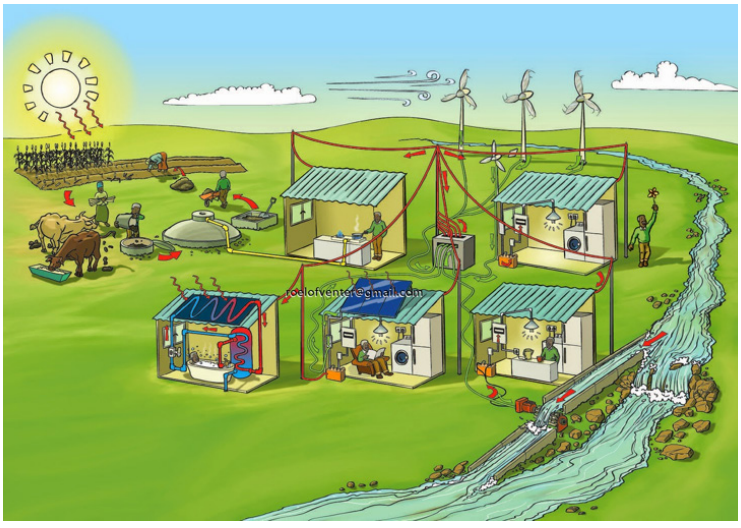
# BACKGROUND

South Africa's energy sector is undergoing fundamental change, as are the energy sectors of all the world's major economies. Energy generation is becoming more dependent on renewable, as opposed to non-renewable or fossil fuel, resources. Energy supply and distribution are becoming more diverse and decentralised. Energy consumers are becoming prosumers.




**Source:** Wikipedia

This energy transition is reflected in the recent Government policies, including the updated versions of the Integrated Resource Plan, which are intended to take the country towards a more sustainable energy future. All of these have in common the issue of energy security and its contribution to job creation, economic growth, research and human capacity/skills growth.



**Source:** http://roelofventer.blogspot.jp

In the **Graduate School of Technology Management**, we focus on the systems engineering and policy aspects of this energy transition. The school has modules covering technology management, innovation management, science and technology policy, systems engineering and the circular economy. These courses provide the ideal background for students to understand the significance of the transition, and how to engage with the opportunities which it is creating.

# RESEARCH AREAS AND STUDY LEADERS

## WHO ARE WE?

In support of this the GSTM some years ago established a small but active Energy Systems Analysis Research Group. The group is led by three experienced academics, supported by a number of research students.

Dr Jörg Lalk (PrEng)

**Dr Lalk is a professional electrical engineer with electrical and electronic engineering degrees from the Potchefstroom University for CHE (BSc and BEng Hons), University of Pretoria (MEng) and a PhD with a focus on systems design from Cranfield University, United Kingdom.**

In addition he has completed the UNISA/WIPO Specialisation Programme in Intellectual Property Law as well as the MIT Sloan School of Management's Programme on Developing and Managing a Successful Technology and Product Strategy. He is member of the International Council on Systems Engineering (INCOSE). He is a past-president of the INCOSE South Africa Chapter and the serving INCOSE Associate-Director for Technical Review (international).

He has some 32 years industry experience and held various senior management and systems engineering positions in the aerospace, automotive, ICT, energy (nuclear) and consulting industries. His current research focus is on systems engineering and energy research, the latter with specific focus on techno-economic analysis, the application of novel intelligent Kalman filter techniques applied to energy planning analysis and the application of systems engineering in energy.

For a full list of publications, see:
Dr Lalk

Dr George Alex Thopil (PrEng)

**Dr Thopil is a registered professional engineer and a NRF (Y) rated scientist. He has a Bachelor's and Master's degree in electronic engineering from VTU, India and Stellenbosch University respectively. He holds a PhD in engineering management with a focus on energy and environmental policy, from the University of Pretoria.**

Additionally he has completed his professional education in energy, sustainability and life cycle assessment, from MIT, USA. He is currently chair of the Engineering Management Society, South Africa chapter. He is also a member of IEEE and a senior member of SAIEE. He is employed at the Graduate School of Technology Management at the University of Pretoria where his research focus is mainly on the topics of energy and environmental policy, energy efficiency and impact assessment of energy technologies. He also lectures and consults on a part-time basis on topics of energy and life cycle analysis.

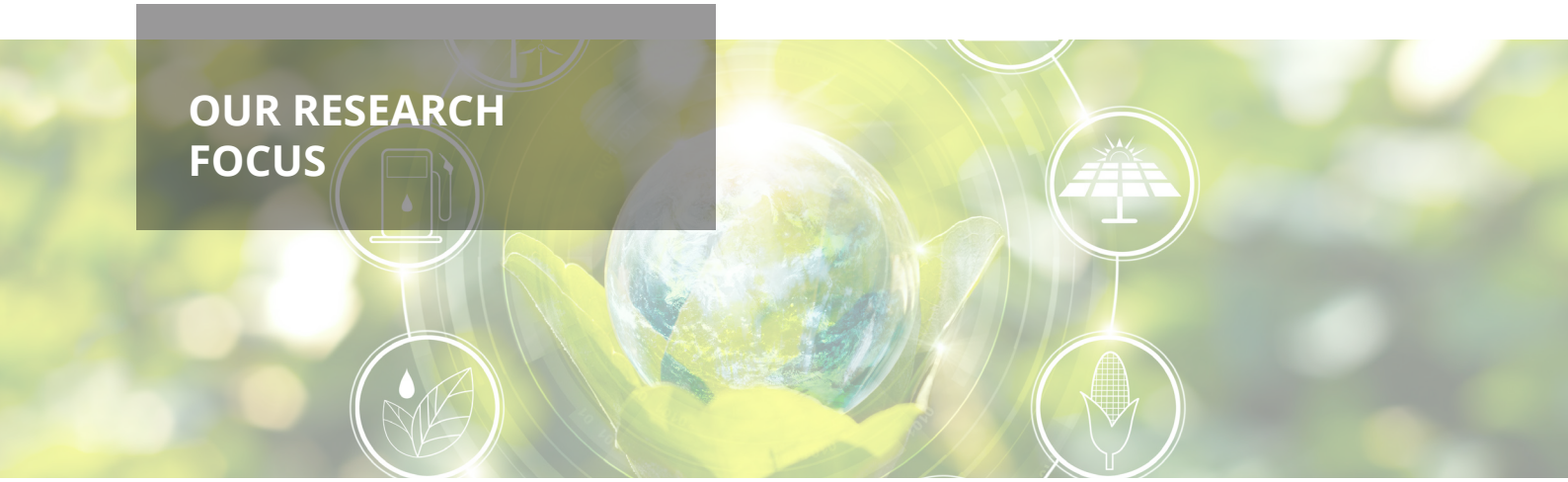
For a full list of publications, see:
Dr Thopil

Prof David Walwyn (PhD)

**Prof Walwyn is a chemical engineer with a PhD from the Cambridge University in organic chemistry. His research interests cover sustainability transitions, renewable energy, health economics, science policy, research methodology, research management and localisation.**

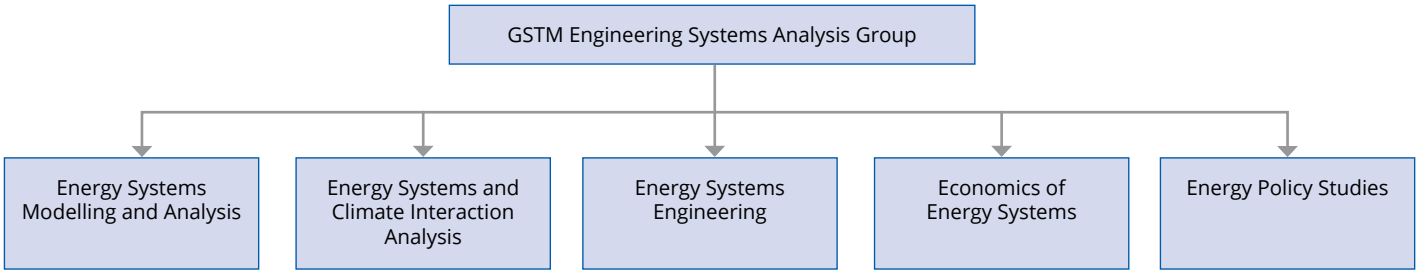
He currently teaches research project and engineering economics. He supervises at least 15 Masters students each year on the management of innovation and technology programme offered by the University of Pretoria, and has two PhD students. He has published widely in the area of science and technology policy, renewable energy, research management, health sciences, performance indicators for research organisations and biotechnology (1 patent, 31 articles in peer-reviewed journals, 5 book chapters and 36 conference papers and presentations).

For a full list of publications, see:
Prof Walwyn (1)(2)



# OUR RESEARCH FOCUS

**The group focuses on a number of important themes within the overall national energy picture.**




In addition to the above themes we also do research on systems engineering (as applied to energy systems), as well as advanced energy prediction models, energy policy, energy justice, energy costing models and tools, transitions in energy-based socio-technical systems, multi-level perspectives and technological innovation systems.

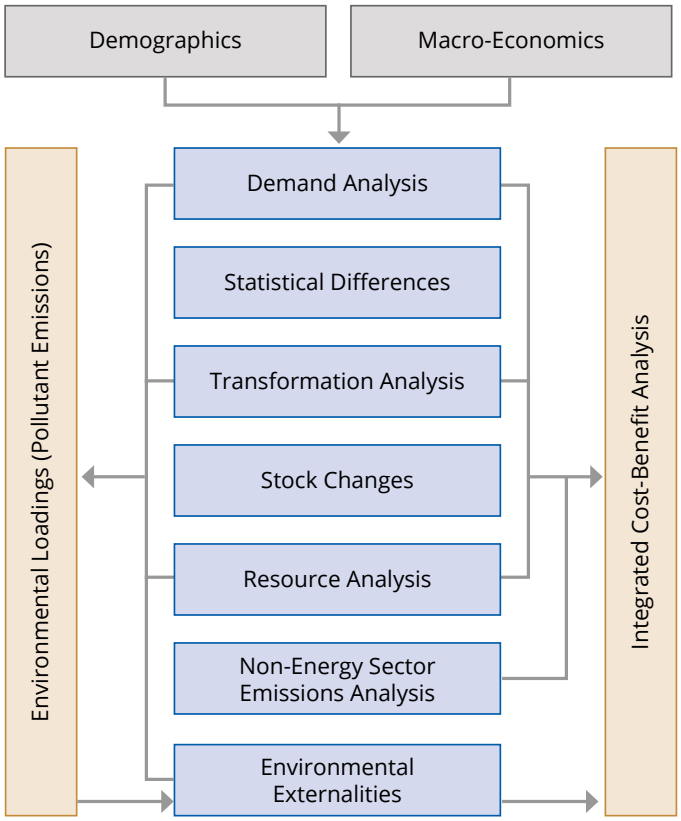
# OUR FACILITIES AND TOOLS

## In support of this the group has available a number of high-end work stations in support of appropriate energy modelling and simulation.

These work stations are all available with some of the "best-of-breed" energy modelling tool sets such as Matlab (including relevant toolboxes such as), HOMER, LEAP (Long Range Energy Alternatives Planning scenario-based tool) OSeMOSYS (Open Source energy MOdelling SYStem), PLEXOS (Integrated energy modelling tool; work stations will only be made available with PLEXOS upon request and motivation by students as a specific agreement on its use is required from the tool vendor/ developer) and WAsP (industry standard wind energy resource modelling).

These work stations are available to students who can spend a reasonable amount of time on campus or are full time students. In certain cases some of the tool sets are also available as academic licenses for use by individual students on their own computers (this requires an application by the student to the tool set vendor who may make such a license available on a time restricted, typically 6 months at a time, basis).

Some of our current student research projects focusing on desalination and carbon tax analysis make extensive use of our Matlab and LEAP tools.




**Source:** LEAP Tool Calculation Model, https://www.energycommunity.org

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# RESEARCH OPPORTUNITIES

The group has opportunities for masters and doctoral research projects in any of the research themes of the GSTM Energy Systems Analysis Group.

**We are specifically looking for students who:**

- Have strong analytical skills
- Have a systems view yet remain cognisant of the details
- Are excellent two-way communicators inclusive of excellent English writing skills
- Are naturally curious and self-driven
- Are committed to deliver high-quality results on time
- Are interested in sustainability transitions and renewable energy

We are also looking for a few students who possess the characteristics above and in addition have strong mathematical and statistical skills. These students will be tasked to do their research on Advanced Energy Prediction Algorithms and Advanced Energy Costing Models. Students who, in addition, also have a strong software background are also required to participate in a project on the integration of energy modelling toolsets.

## CONTACT US


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