Visualisation of results in the South African LTMS
What is 'visualisation' in this context?

- A way of avoiding awful powerpoint slides such as this one when presenting data.
- Presenting information spatially to show complex relationships between different elements in a visual form.
- A way of thinking about large complex data sets which would be very difficult by just looking at the numbers.
- An easy, intuitive way to see patterns, and to highlight important results.
- A way to communicate the essence of complex results outside of one's field.
Overview of the LTMS

- A scenario-based process in South Africa from 2006-7, to determine what South Africa's mitigation potential is.
- A blend of technical analysis and stakeholder involvement/engagement – 'process'
- Much communication and interaction between every step of the technical analysis and stakeholders
- Many different audiences, many of whom were not familiar with the basic concepts.
The problems

- How to express the problem we were looking at – long-term mitigation – in a compelling way?
- How to break the problem down visually, to facilitate discussion?
- How to portray a manageable number of options and tradeoffs?
- Internal process of technical analysis – how to track results etc, and facilitate interaction between different research teams?
Basic framing

- Baseline
- What 'science' requires
- What current policy will do
- The MASSIVE gap
Two Scenarios:
Growth without Constraints and Required by Science

Growth without Constraints
Current Dev Path
Required by Science

THE GAP
'Wedges' – mitigation options

- Challenge was to represent these options in a way which was plausible but not too technically detailed.
- Another problem was comparing them – the key problem was getting people to understand which ones were large and important, and which ones were insignificant.
- In the end, there was too much detail – the actual 'wedges' were replaced by abstract ones, which only represented a quantity.
Small Wedges
around 3% of potential reductions

- CTL with Methane Capture
- Cleaner Coal
- Cement - Clinker Reduction
- Agriculture: Reduced Tillage
- Vehicle downsizing (SUVs)
- Coal Mine Methane 50%
- Agriculture: Manure Management
- Coal Mine Methane 25%
- Aluminium - PFC Capture
Medium Wedges
around 14% of potential reductions

- CTL with CCS – 20 Mt
- CCS Electricity Limited
- Waste
- Land use: fire & savannah
- Hybrid vehicles
- Agriculture: Enteric Fermentation
- Commercial Energy Efficiency
- Residential Energy Efficiency
- Afforestation

Graphs showing various sectors and their contributions to potential reductions, with labels like R56, R14, R50, etc.
Large Wedges
around 83% of potential reductions

- Industrial Energy Efficiency
  - R34

- Renewable Electricity
  - R64

- Transport Mode Shift - Passengers
  - R1047

- Nuclear Energy
  - R21

- Improve Light Vehicle Efficiency
  - R739

- CO2 Tax
  - R13
Putting them together

- Need to draw back from the individual wedges and get a national picture
- Reframed in the original context – drove a requirement for analysis of more ambitious options
- A key element in this was the limits of current measures
Why emissions grow despite tax

- R 1000: Emissions in electricity and synfuels crash
- But industry and transport emissions keep growing
Communicating costs

- Initially, we worked out a cost per measure and added this to the 'wedges'.
- This was used as a criteria for grouping the wedges.
- Then we developed a 'mitigation cost curve', which allowed one to compare measures based on cost, but the x axis was meaningless which was very confusing.
- Sequential model runs compared to GDP was the most intuitive to understand (even though this was difficult to picture).
- The Carbon tax diagramme was also useful.
- Ultimately quite difficult – CGE results even more difficult to communicate.
Large Wedges

around 83% of potential reductions

Industrial Energy Efficiency

- R34

Nuclear Energy

R21

Renewable Electricity

R64

Improve Light Vehicle Efficiency

-R739

Transport Mode Shift - Passengers

-R1047

CO2 Tax

R13
Total mitigation costs in relation to the size of the economy

Mitigation costs as share of GDP, for runs of combined wedges each time adding another as in list at right:

- Limit on low-efficiency vehicles
- +Passenger modal shift
- +Improved vehicle efficiency
- +SWH subsidy
- +Commercial efficiency
- +Residential efficiency
- +Industrial efficiency
- +Cleaner coal
- +Nuclear
- +Escalating CO2 tax
- +Renewables
- +CCS 20 Mt
- +Subsidy for renewables
- +Biofuels
- +Electric vehicles in GWC grid
- +Hybrids
Aggregate mitigation costs compared to the size of the economy

- With industrial efficiency:
  - add Improved vehicle efficiency
  - add Commercial efficiency
  - add SWH subsidy
  - add Nuclear
  - add CCS 20Mt
  - add Escalating CO₂ tax

- Without industrial efficiency:
  - add Renewable
  - add Subsidy for renewables
  - add Biofuels
  - add Electric vehicle in GWC grid
  - add Hybrids

Mitigation cost as share of GDP vs. Mt CO₂ reduced, 2003-2050
Impact of a CO2 tax on emissions (2003 Rands)
Points for discussion

- Simple, complete and coherent.
- The right level of detail is difficult to arrive at – depends very much on the audience.
- Some information is much easier to convey, and some is far more difficult. Levels of abstraction are very important.
- Using very complex model outputs is sometimes very useful as well, depending on the questions which are picked up. Technical complexity can either legitimate the technical analysis, or lead to irrelevant controversies.