Power to Dome A—Michael Ashley / UNSW

- Currently, we have 0.5–1.0 kW continuous capability.
- We need 3–5 kW for AST3 and NIR telescopes in the near future.
- We need 10–20 kW for KDUST, DATE-5.
- Solutions:
  - Solar (we have 1 kW at the moment; fairly easy to add more; this will fuel and increase the service lifetime of the engines).
  - Diesel (we have five Hatz 1B-30 engines; not easy to add more).
  - Wind (possible?).
  - Batteries (can only provide about 24 hours backup).

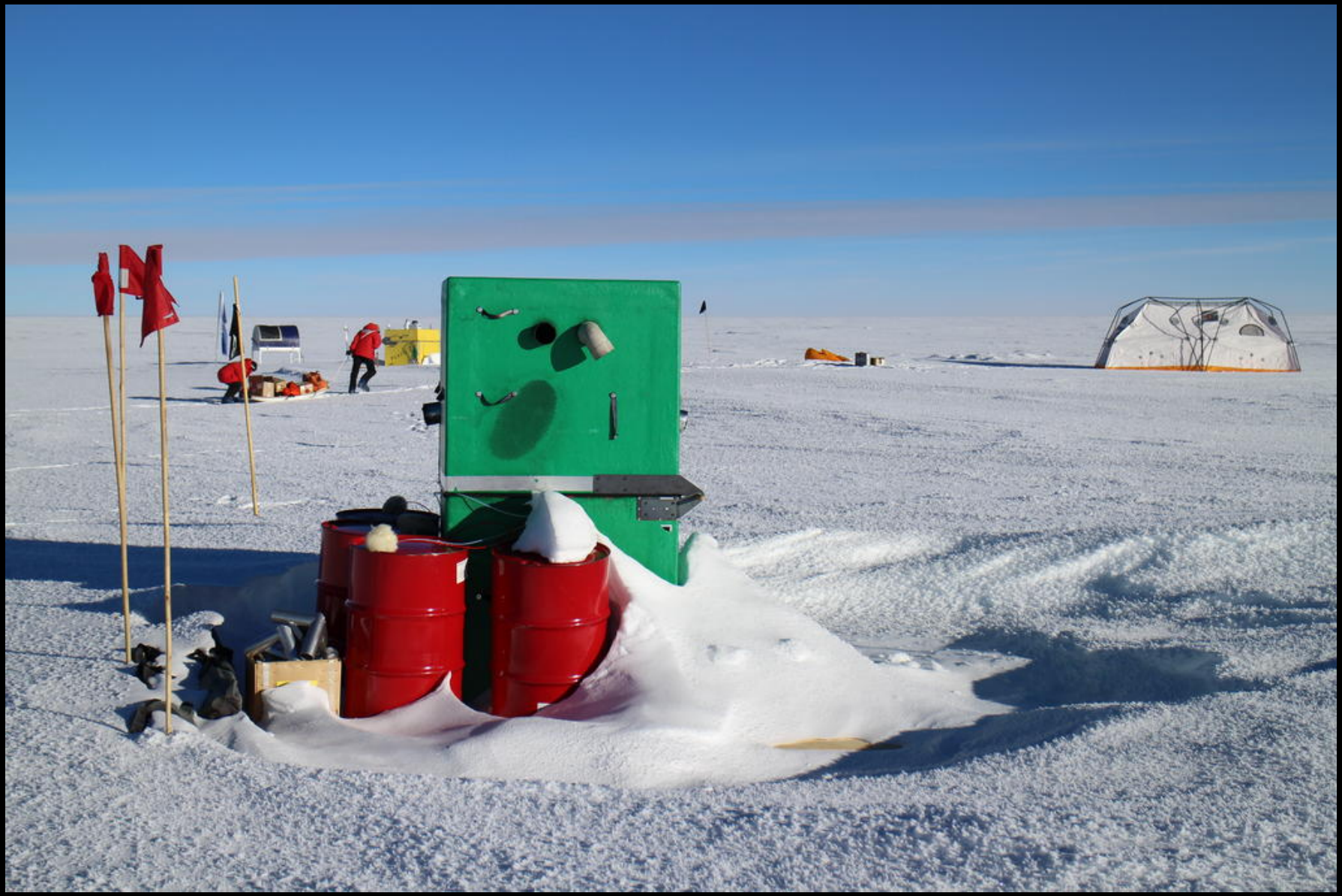
Diesel engines

- South Pole Station, Dome C, etc, use three large diesels (150–1000 kW). They require on-site mechanics all year.
- The typical service interval for a diesel engine is 200 hours, which is a bit over 8 days.
- At Dome A we are running the engines well beyond their design envelope.

PLATO-A limitations

- The PLATO-A design was based on the assumption that all the fuel had to be kept "warm" (above $-50°C$) so that it doesn't gell.
- Our work at Ridge A shows that this is not necessary. We can transfer a drum (200 litres) of fuel at $-70°C$ with a tiny pump, over a week. The pump heats the fuel in its immediate vicinity.
- PLATO-A is hard to service (both the engines and the batteries), very heavy, and difficult to duplicate.

PLATO-A Engine Module, Dome A.



PLATO-R Engine Module at Ridge A, 2014.

LiFePO4 battery pack, Dome A.

Modularity is the key to success

- Small engine modules, weighing perhaps 200 kg, capable of a few kW. No servicing required. Can be moved around on sleds by hand.
- Small battery modules.
- Plug in as many of each as you need. Swap at the end of the year.
- Bus architecture choice: (1) high voltage (400V) DC, or (2) 230VAC microgrid.
- Communications? (1) CAN, (2) wireless, (3) comms over power line.
- UNSW has one engineer and one 4th year thesis student working on the design.

Wind power

- Difficult due to (1) low wind, and (2) low pressure.
- We probably need a hub height of 15 m or so, at which point the wind is about twice as strong as at the ground.
- We may need a specially designed blade.
- We may need to spin-up the turbine in low wind situations.
- UNSW has a 4th year thesis student working on computational fluid dynamic calculations and blade design.

Funding

- PLATO-A has been funded through NCRIS (National Collaborative Research Infrastructure Strategy).
- The continuation of NCRIS is not guaranteed.
- Even with NCRIS funding, we are unlikely to have enough funds for a major engineering effort.