EXERGY

Making
Energy
Efficiency
Work For You

Achieving Energy Performance in spite of complex systems and dis-jointed design

Presented by

Caoimhin Ardren

12/11/2012

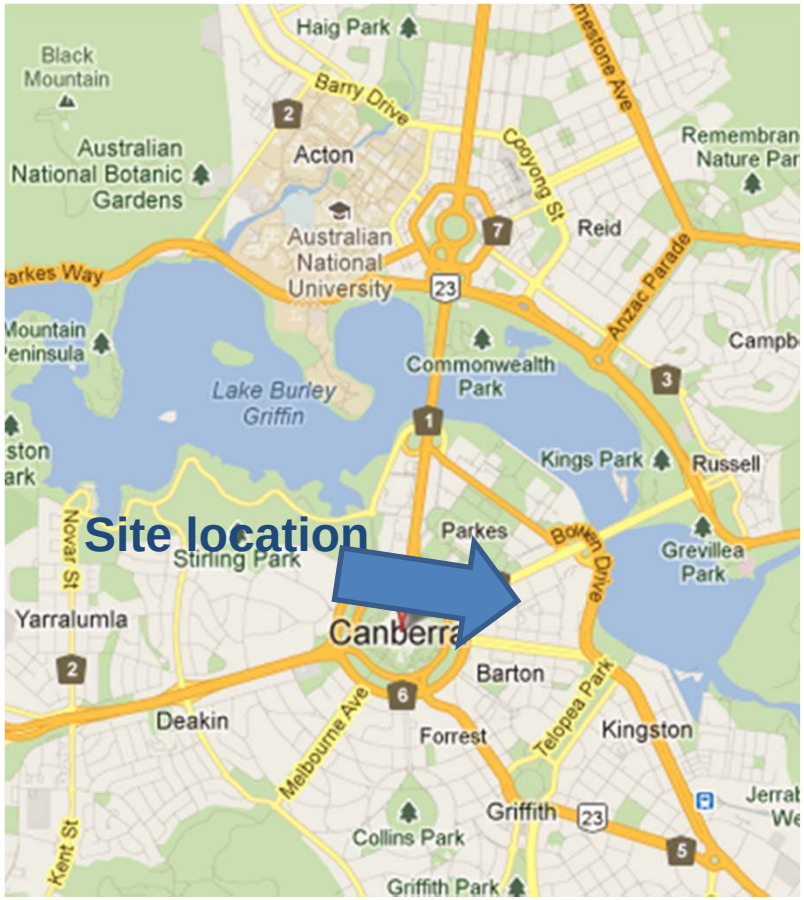
EXERGY

Presentation overview

- Project and performance target overview
- Measurement - NABERS and Soft landings
- Project challenges
- Solution methodology
- Assessment against Soft landings
- Lessons learnt
- Conclusions

EXERGY

Project overview - location



EXERGY

Project overview

- Complete refurbishment of sandstone heritage building
- Grade A office building 5,000m^2
- Substantial data centre (125kW)
- Incomplete design and specification
- Lump sum contract
- Required commissioning skills

EXERGY

Performance targets and outcomes

- Separate Base Building and tenancy targets
  - Base Building > 4.5 Stars NABERS
  - Tenancy (excl data centre) > 4.5 Stars NABERS
  - Tenancy (Incl data centre) >1 Star NABERS
- NABERS is:
  - National rating system
  - Australian buildings, tenancies and homes
  - measures the energy efficiency and its impact on the environment.
- It uses measured and verified performance information and converts it a 6 star rating scale

EXERGY

NABERS – as a measurement system

- Four environmental rating tools
  - NABERS Energy,
  - NABERS Water,
  - NABERS Waste and
  - NABERS Indoor Environment

www.nabers.gov.au

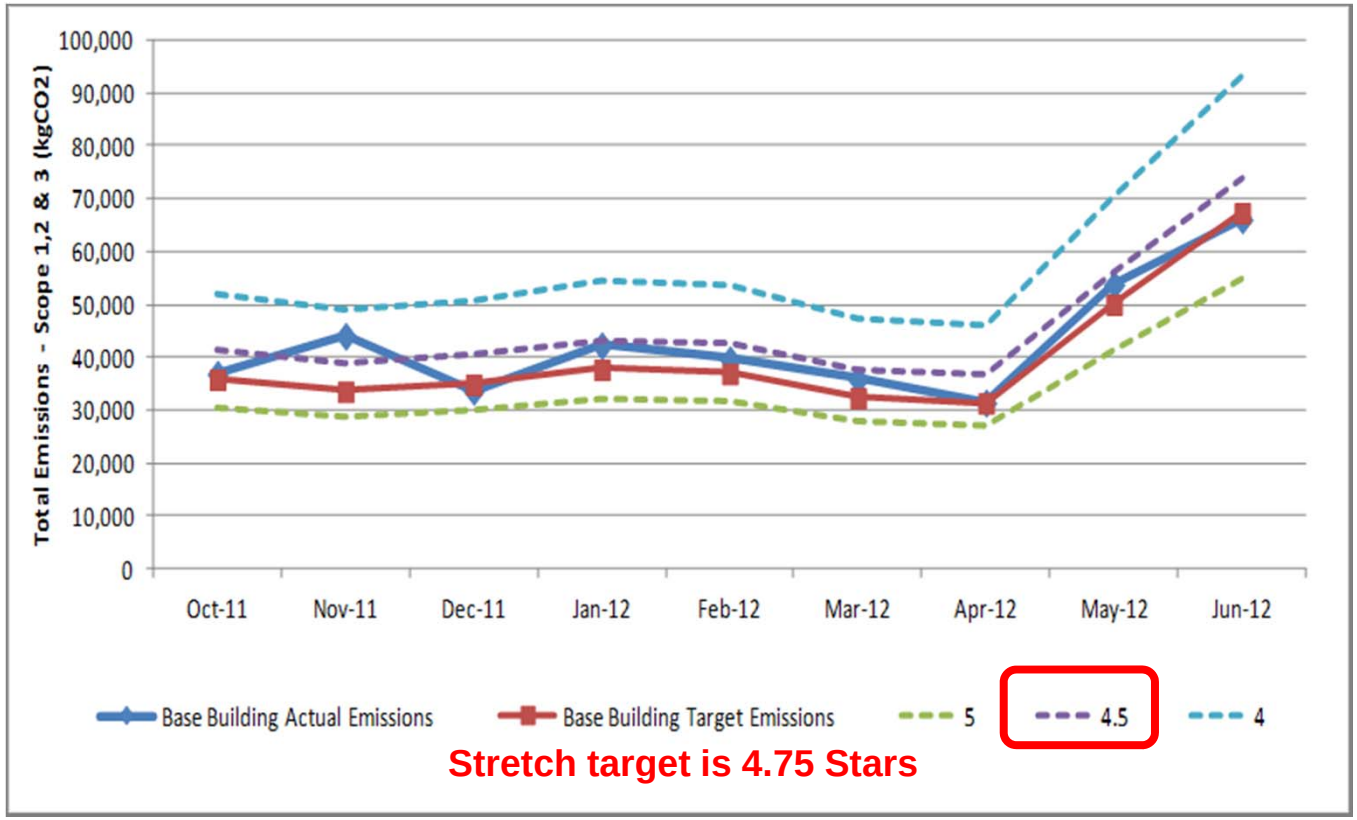
The NABERS rating tools

- measures actual operational performance of existing buildings and tenancies. (energy in kg/CO2/m2/pa)

EXERGY

Achieved targets

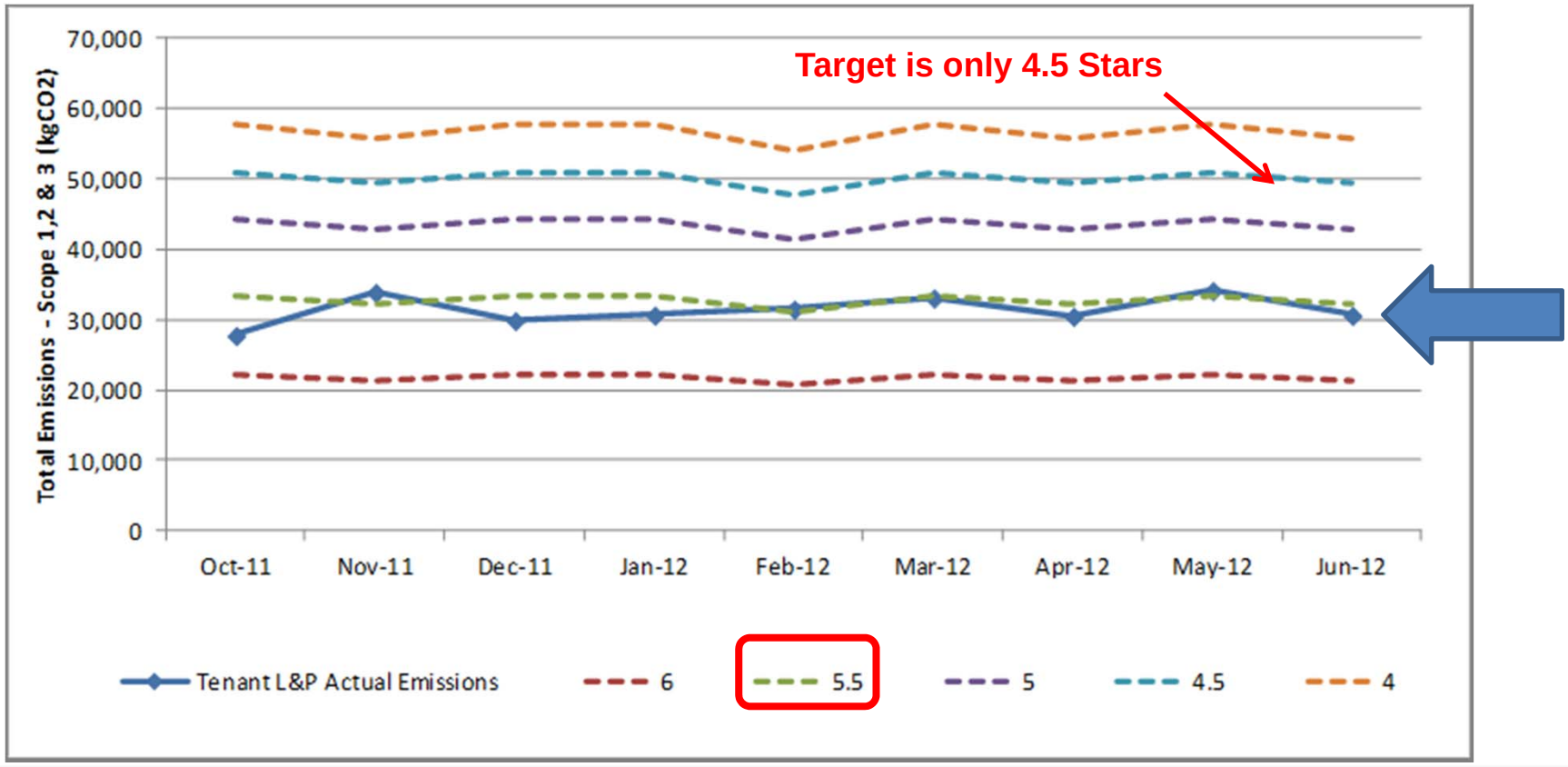
- Base Building reached 4.5 Stars – tracking well



EXERGY

Achieved targets

- Tenancy (Excl Data Centre) exceeding target



EXERGY

Soft Landings – what is it?

- An open source protocol developed by BSRIA and Usable Buildings Trust
- For improved delivery, hand over and operation of high performance buildings
- Continuity of outcome focus across 5 stages
  - Inception and briefing
  - **Design development & review**
  - **Pre-handover**
  - **Initial after-care**
  - Extended after-care years 1-3
- 12 core principles
- Rolled out in 2009

EXERGY

Project challenges

- Incomplete and faulty design
- Sub-contractors lack commissioning experience
- Complex system integration (Data Centre)
- Poor response and attendance – designers
- High security – no comms on site
- Demanding client/tenant
- Rental review linked to performance

EXERGY

Methodology

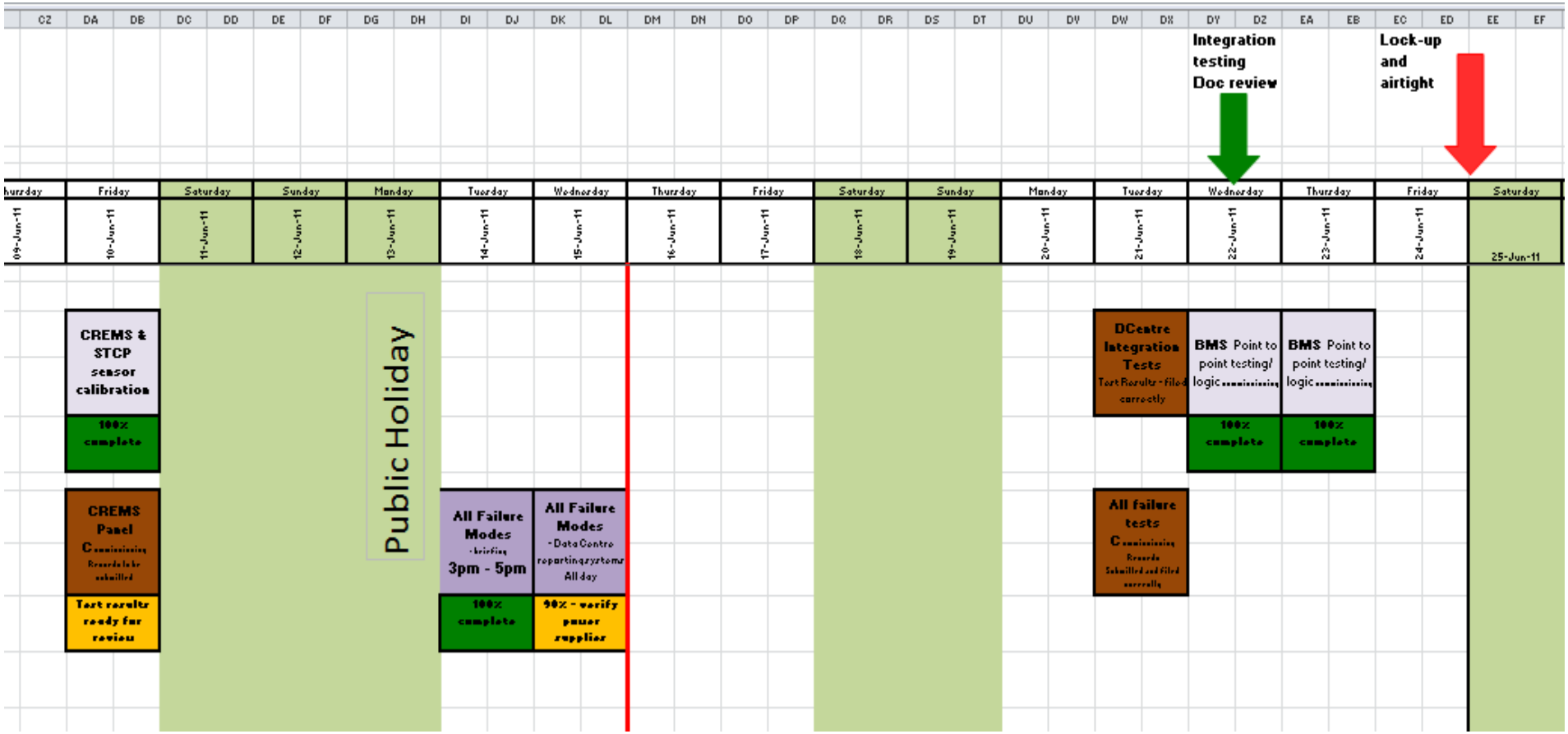
- Planning stage
  - Develop commissioning plan & procedures
  - Clear commissioning objectives
  - Establish leadership, define roles and responsibilities

EXERGY

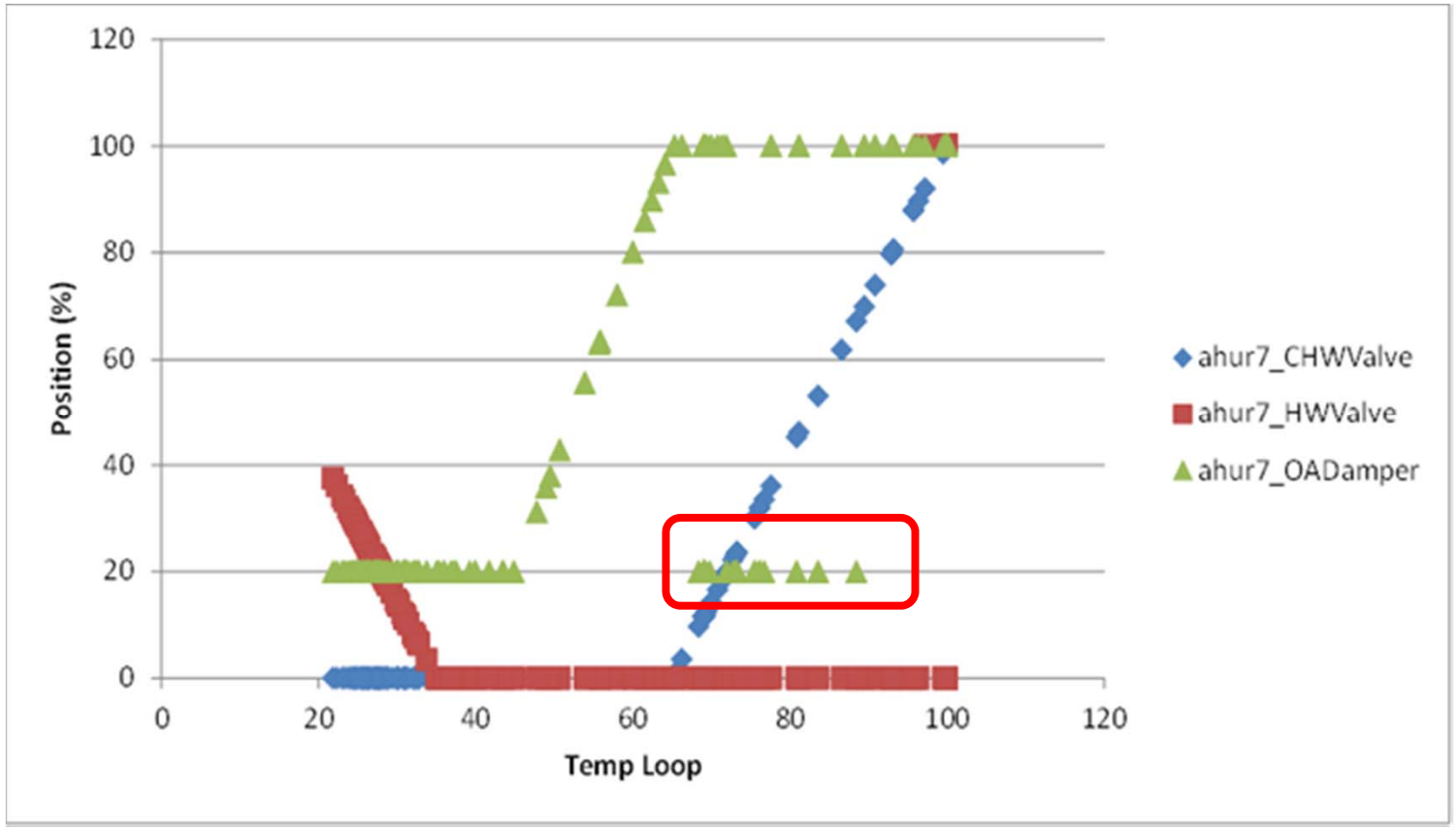
Methodology

- Implementation stage
  - Structured and frequent feedback
  - Continuous monitoring and verification
  - Handover, training and tuning plans
  - Register of issues

EXERGY


Integration testing Doc review
Lock-up and airtight
Friday
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
10-Jun-11
11-Jun-11
12-Jun-11
13-Jun-11
14-Jun-11
15-Jun-11
16-Jun-11
17-Jun-11
18-Jun-11
19-Jun-11
20-Jun-11
21-Jun-11
22-Jun-11
23-Jun-11
24-Jun-11
25-Jun-11
CREMS & STCP sensor calibration
100% complete
CREMS Panel
Test results ready for review
Public Holiday
All Failure Modes
3pm - 5pm
100% complete
All Failure Modes
- Data Centre
All day
90% - verify power supplier
DCentre Integration Tests
All failure tests
BMS Point to point testing/ logic
100% complete
BMS Point to point testing/ logic
100% complete

EXERGY



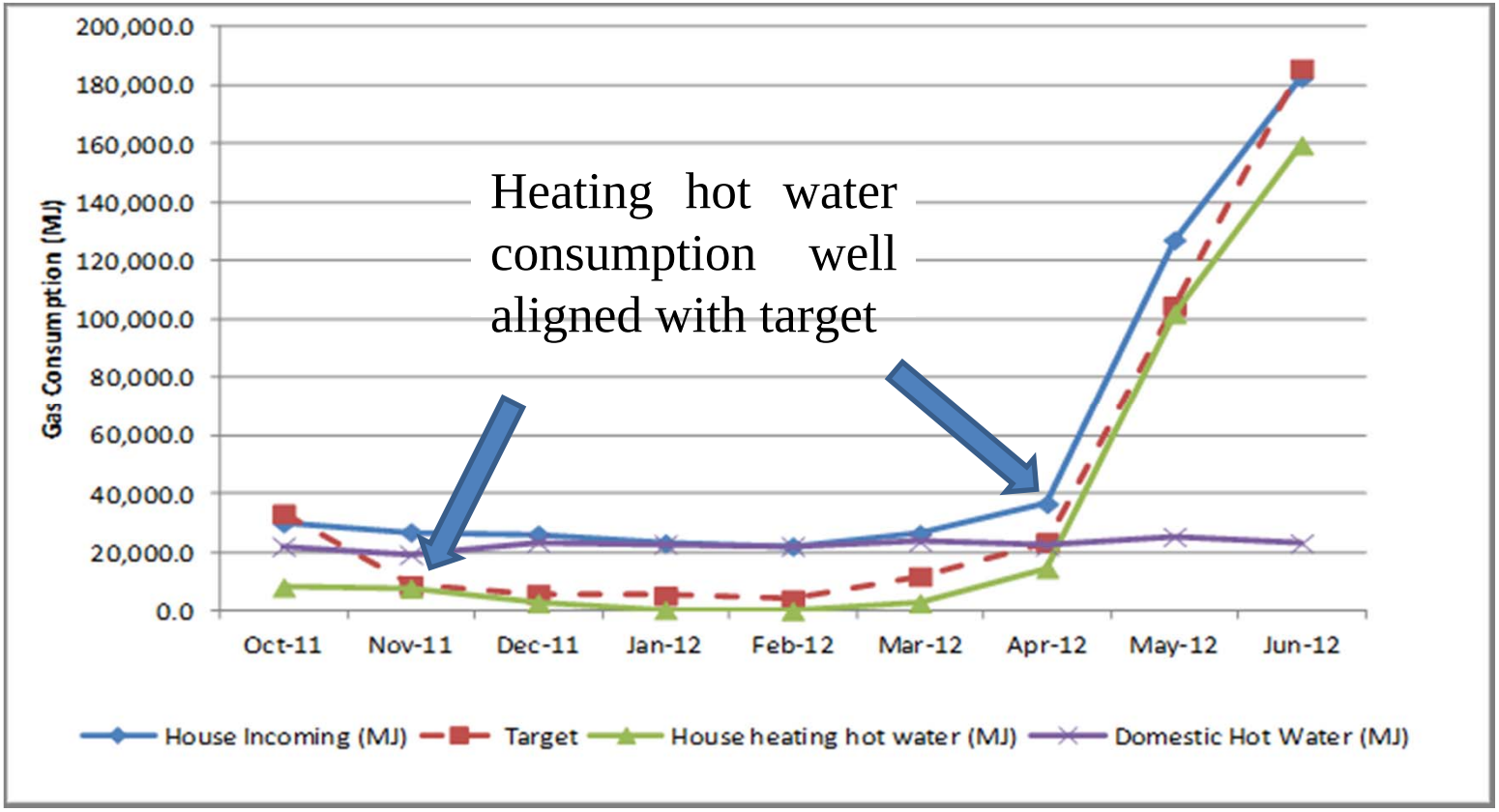
Trend log confirming AHU response to temperature loop (Moffitt, 2011)

EXERGY

Methodology

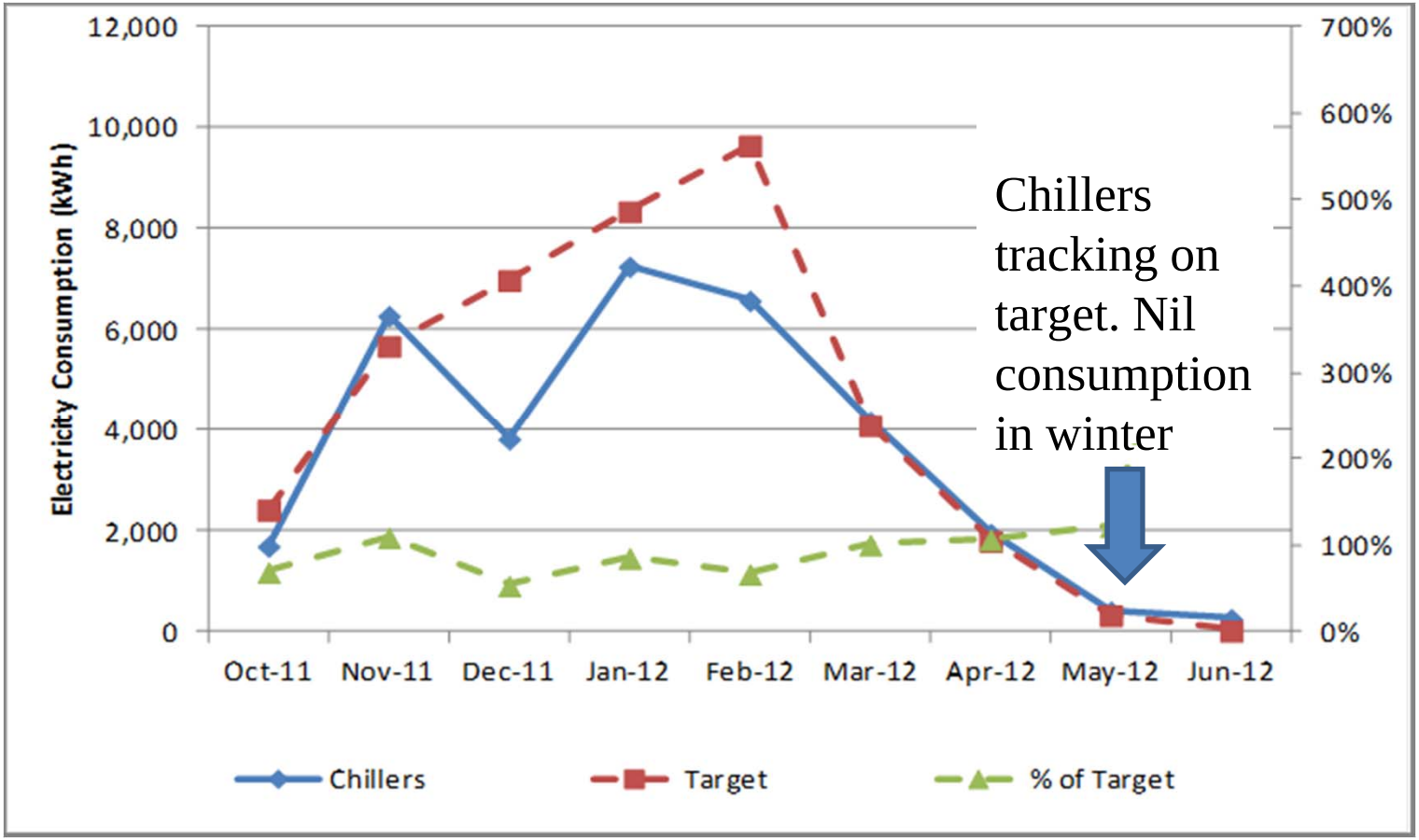
- Tuning stage
  - As-builts, O&M Manuals and deliver training
  - Engage with Building manager and maintainers
  - Leadership of tuning and monitoring activities
  - “Close out” issues identified during implementation stage

EXERGY



Trend log of Base Building gas consumption – against target (Moffitt, Ardren, 2012)

EXERGY



Trend log of Base Building Chiller energy consumption (Moffitt, Ardren, 2012)

EXERGY

Verification against Soft Landings

Item	Framework and core principle	Applied Yes/No	Effectiveness
1	Adopt the entire Soft Landings process from commencement. Be explicit in implementation through all 5 stages	No	Our observation is that it is essential to be brought in to play before commissioning planning begins. Earlier is preferable, but maybe not as critical
2	Provide leadership and have champions for Client and Contractor. Engender trust and open/honest collaboration	Yes	Clear leadership definitely helped the team embrace and focus on performance outcomes. While there was a bit of a "contractual" mindset overshadowing completion, in terms of demonstrating operation of systems, all parties had a "no blame" attitude and "pulled together" to make sure it all worked correctly and efficiently

EXERGY

Verification against Soft Landings

3	Set roles and responsibilities for all stages and ensure continuity. Active participation of client/owner and occupant representative	Yes	Unclear role definitions resulted in a lack of ownership of outcomes As leadership was established, focus on outcomes improved dramatically. The same leadership continued throughout Continuity of performance intent was essential from construction to occupation and operations
4	Ensure continuity of Soft Landings thread throughout the entire project	No	As noted above, a successful outcome has been achieved, even though the initial stages of the project did not focus on the performance outcomes Observations indicate that person nominated to be responsible for carrying the continuity of intent through from one stage to the next.

EXERGY

Verification against Soft Landings

5	Commitment to post Practical Completion "aftercare" for 3 years with continuous feedback in place	Yes	Has proven to be critical to the achievement of the target performance Structured tuning and regular measurement / reporting against targets Remedial actions done in a time
6	Share risk and responsibility in a collaborative "no blame" approach	Yes	Since there was no contractual obligation for the construction team to achieve the performance outcomes, sharing of risk was practiced. This "no blame" mindset definitely contributed to the willingness of parties to contribute and collaborate.

EXERGY

Verification against Soft Landings

7	Use feedback and surveys to inform design	Yes	Feedback and contribution of ideas and experience from previous projects had a big role to play in the success of this project. Occupant observations and feedback have had significant input into the resolution of issues and identification of energy efficiency opportunities Lack of participation by the design engineers, has prevented them from incorporating in future designs.

EXERGY

Verification against Soft Landings

8	Focus on operational outcomes in-use and refine targets	Yes	The continuous focus and attention to in-use performance outcomes has unquestionably contributed to the success of the outcomes to date. Regular tracking and monitoring of energy use against target has been essential in maintaining focus. Targets will be reviewed and refined in next quarter
9	Involvement of Building Manager and maintenance crew	Yes	Early involvement of the Building manager and maintenance crews, prior to commissioning provided substantial value to the process.

EXERGY

Verification against Soft Landings

10	Involve end-users in all stages of the project	Yes	Early involvement ensured that the occupants were able to operate the building efficiently in record time. A Building Users guide was developed from the perspective of occupants. Customised "Quick reference" cheat sheets were produced and placed above each piece of equipment. Direct feedback from occupants, has been crucial in the identification of efficiency opportunities in the work spaces

EXERGY

Verification against Soft Landings

11	Set realistic performance objectives	Yes	In Australia, the NABERS rating scheme provides a realistic industry benchmark. This allows for the identification of achievable performance goals. All monitoring and measurement is carried out following strict protocols against these standard benchmarks.
12	Communication and information sharing between all parties over each stage	Yes	Regular and open communication in terms of expected outcomes and required activities played a major part in the finalisation of the commissioning and handover processes. During the latter part of the12 months of "aftercare" to date, communication has diminished-performance improvements are lagging behind.

EXERGY

Conclusions

- Contrary to expectations of failure…
- delivered performance outcome that exceeds industry experiences and timelines.
- Soft Landings core principles have demonstrated best practice outcomes in a timely manner
- Additional practices
  - more structured in-depth analysis of system operations prior to hand-over
  - planning requirements for the tuning process
  - defining the Soft Landings lead role through-out all stages
  - Require active independent verification of planning and execution
  - define the scope and procurement services post 12 months DLP
  - define the need for post-occupancy training and coaching for occupants and maintainers

EXERGY

Questions?