

# Cogeneration: Operational Performance

AIRAH, Melbourne  
21 October 2015

Niraj Patel

# Reasons for the Study

- Anecdotal evidence suggesting that performance not as expected
- Seek to better understand why this is the case
- Earlier study completed for the Crown building

# Two Studies

- Two studies completed simultaneously in Melbourne and Sydney



THE UNIVERSITY OF  
SYDNEY



# About the sites

- 6 office buildings and 1 education building
- Sites located in Sydney and Melbourne
- 4 sites were new builds
- 2 existing assets with cogeneration incorporated as part of a major upgrade
- 1 late development retrofit
- All results anonymous

# Why cogeneration

- Carbon footprint reduction using gas for energy
- Green star credits in new builds, NABERS for existing
- Bias towards industry trends
- Tenant desires to be seen as sustainable

# Key technical considerations

- Plant sizing
- Co or tri generation system
- Periods of operation
- Efficacy of absorption chillers
- Ability to run optimally

# Study Methodology

- Visit existing buildings and obtain operational data from the facilities management
- 3 buildings in Melbourne study

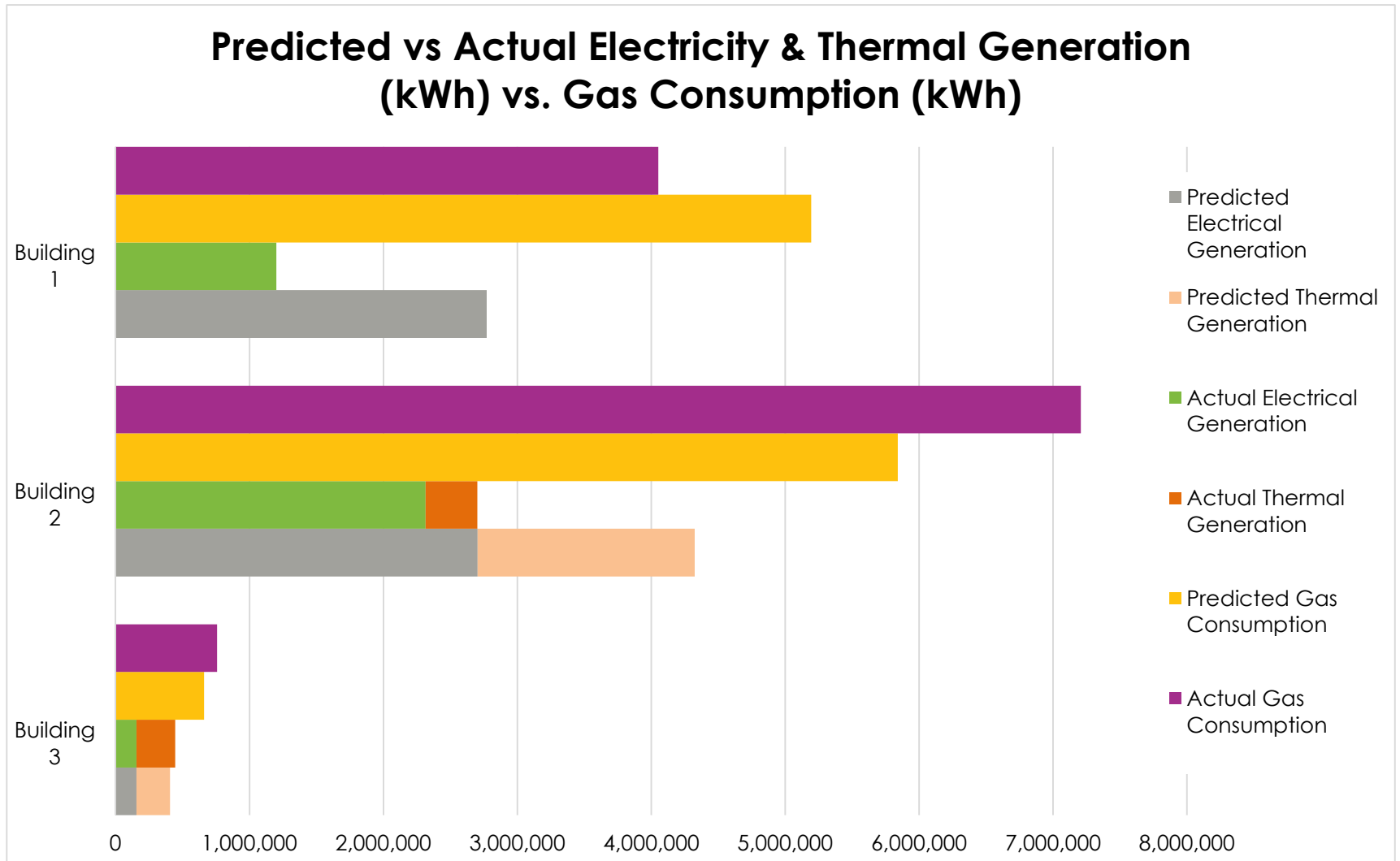
# Melbourne Case Study

## Buildings Summary

Building	Building Type & Install date	System Configuration	Goal	Electric Capacity	Project Delivery	Network Connection
Building 1	Commercial Office (existing) ~2009/10	Co-generation	5-star NABERS	800kW	Energy Performance Contract	No electric export
Building 2	Education (new) 2013	Co-generation	6-Star Green Star	1,000kW	Traditional D&B	Electric export to be implemented
Building 3	Commercial Office (new) 2006	Tri-generation	Low emissions design	60kW	Traditional D&B	Electric export allowed

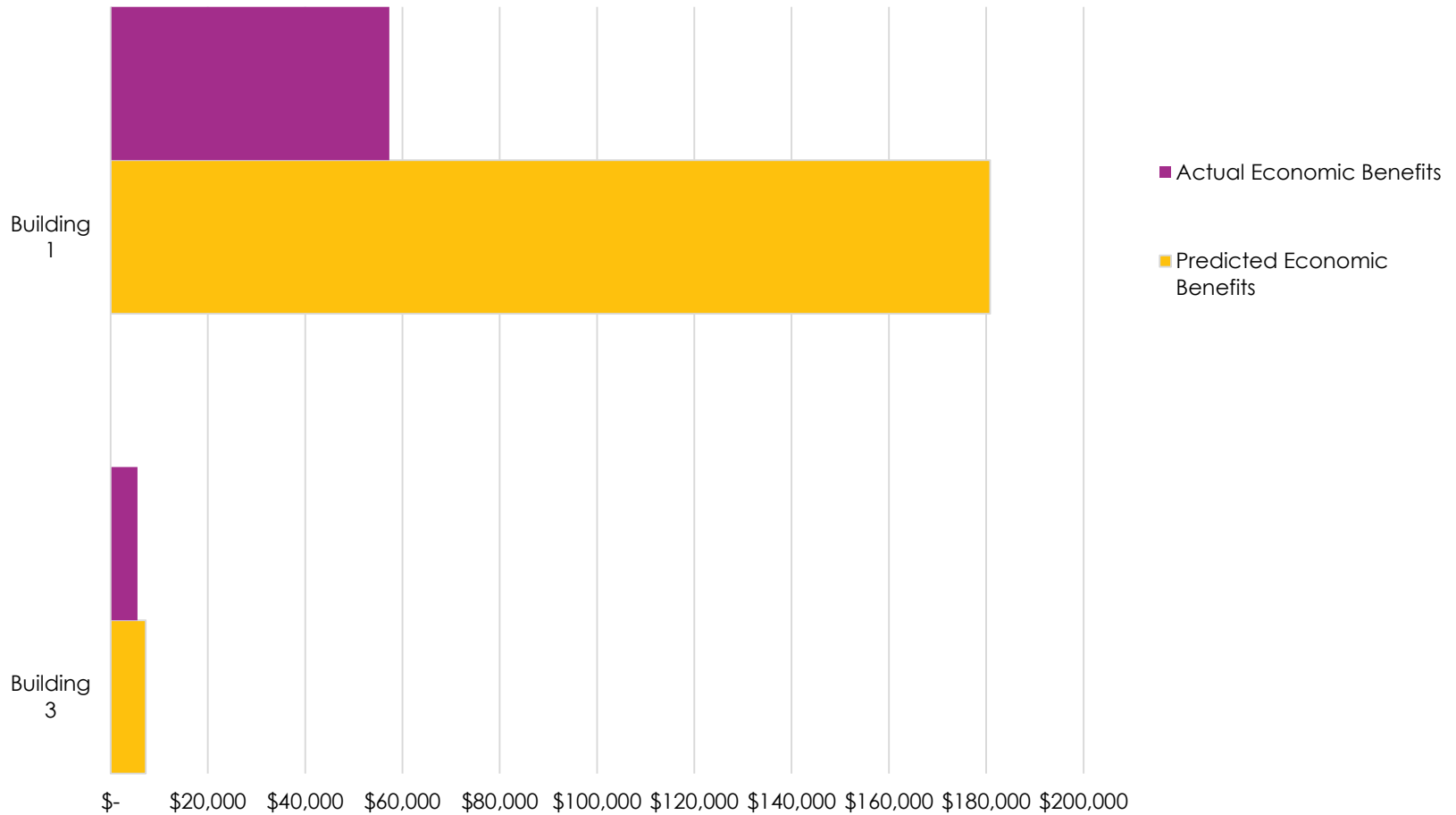


# Predicted vs. Actual Energy



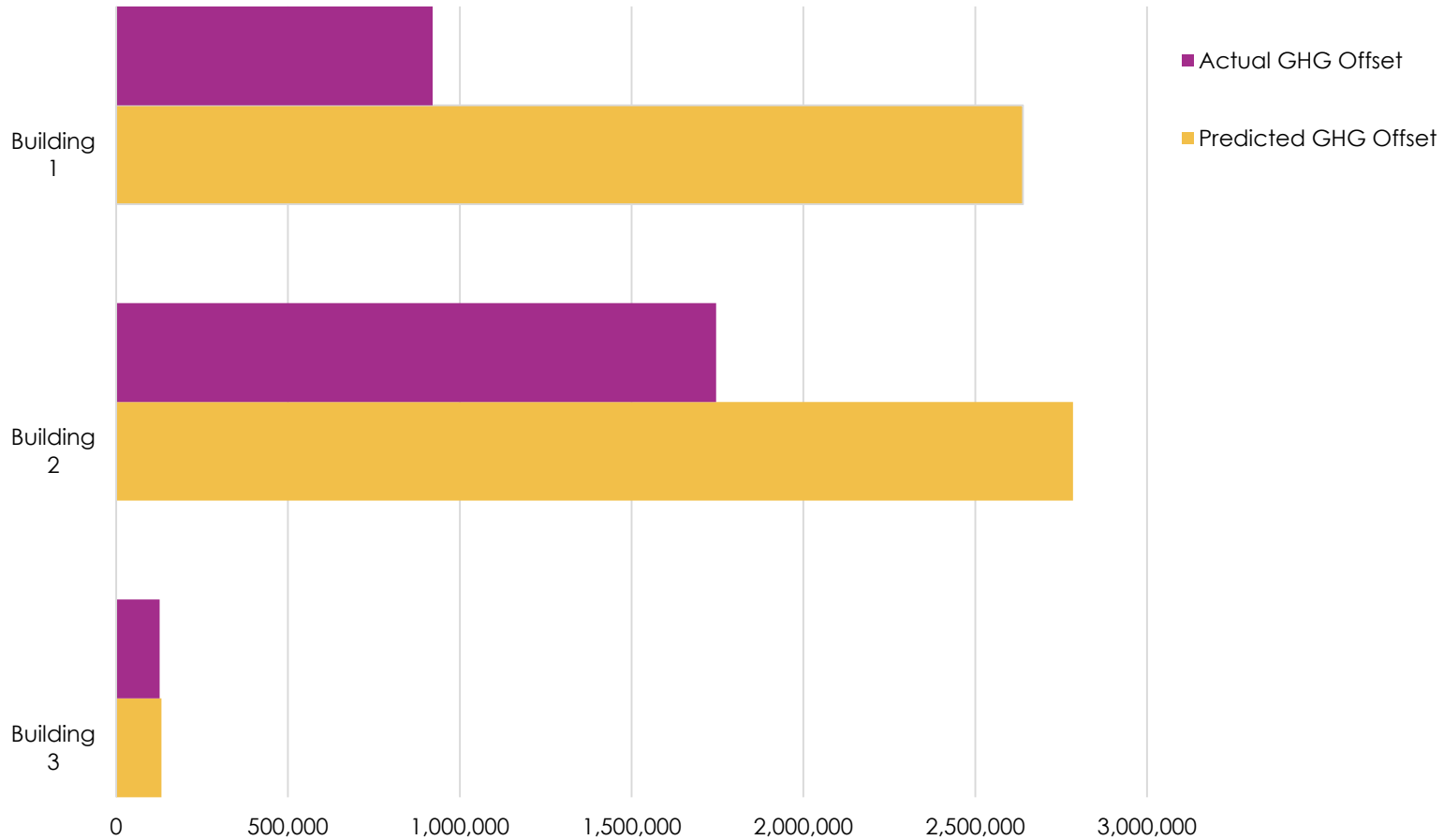
# Predicted vs. Actual Economics

## Predicted vs Actual Economic Benefits



# Predicted vs. Actual GHG Offset

Predicted vs Actual GHG Offset (kg-CO<sub>2</sub>eq)



# Building 1 Issues

- Facilities Manager
  - In operation for 2-3 years
  - Only connected to base building mechanical equipment
  - Winter – no electrical load / Summer – too much heat
  - Generator failure, offline for 16 months
  - Future gas price increase concerns



# Building 2 Issues

- Independent Commissioning Agent
  - Not discharging heat to hot water loop
  - Incorrect pump specification and other detail design problems



# Building 3 Issues

- Facilities Manager
  - Condenser water temperatures must be high for correct operation
  - Electric chillers must run before absorption chiller, not the intended design
  - Otherwise smooth operation



# Sydney Study

- Maintenance
  - Cogeneration not core business
- Energy profiles overestimated
  - Building 2 increased size for GS points
- Changing energy cost

# Future of Cogeneration

- Mixed use developments / communities and hospitals
- Energy security
- Design Fundamentals



**With kind thanks to:**

