Human Resource Development for the Proposed 9.6 GW Nuclear Build Programme in South Africa

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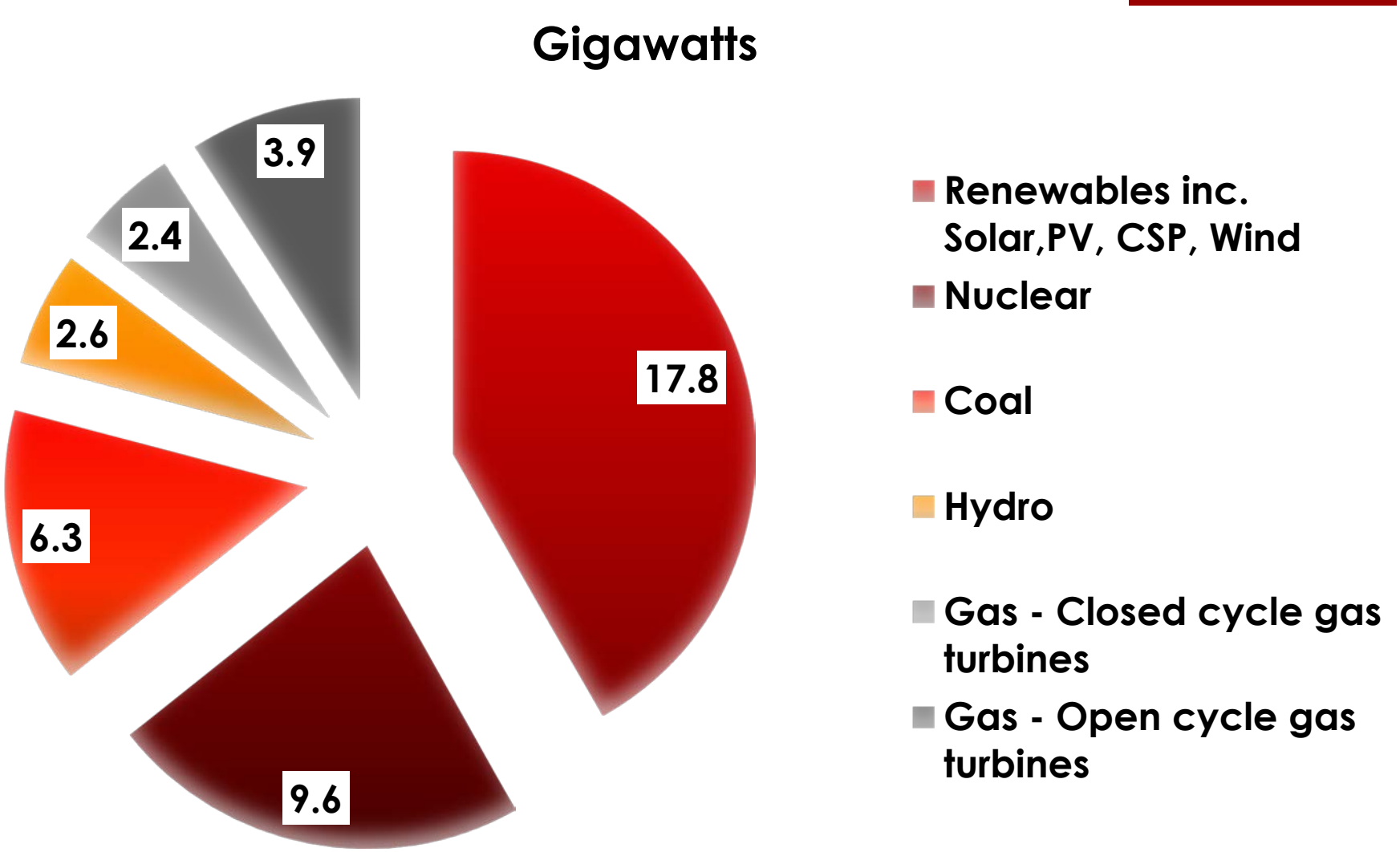
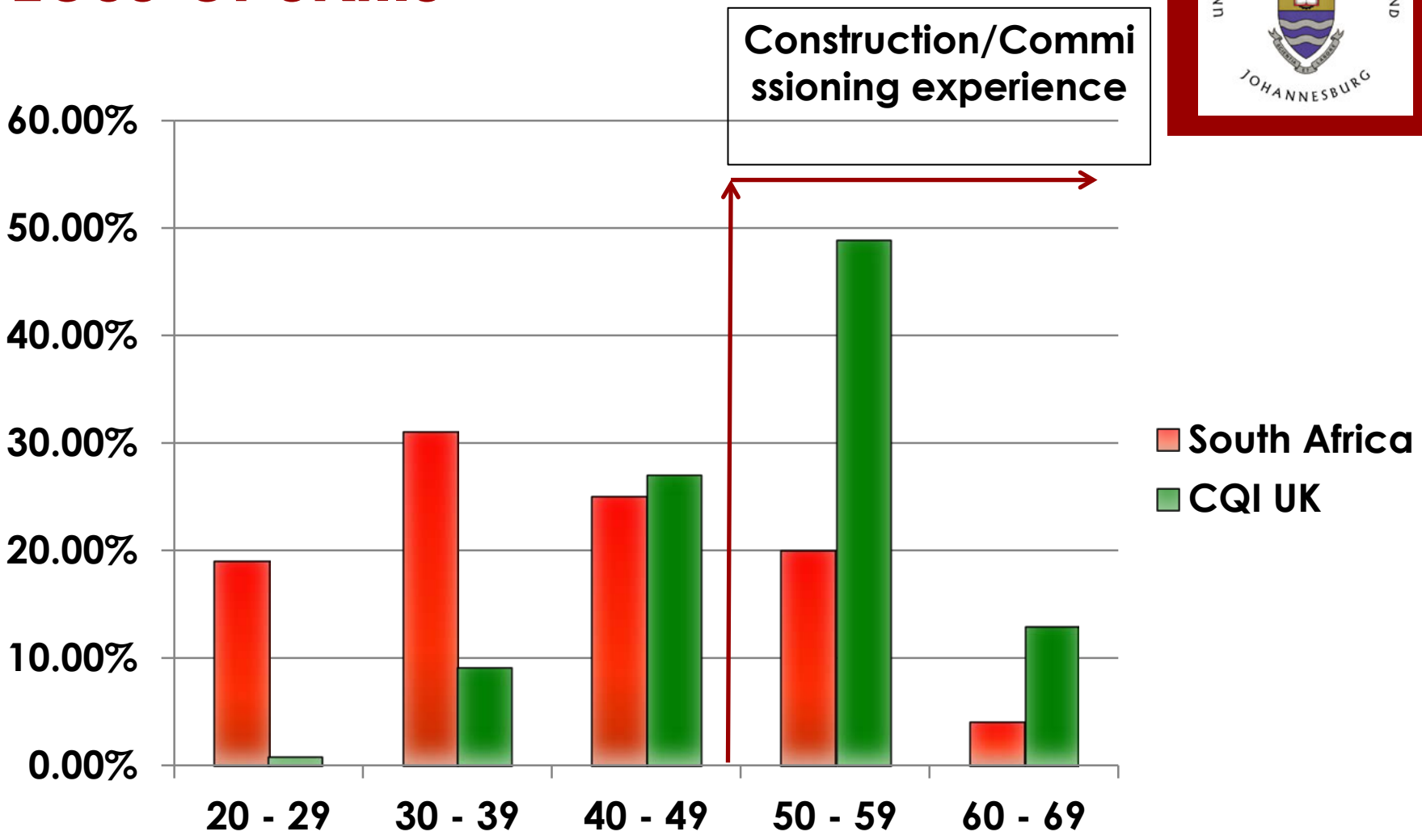
Background

- Population ~ 51.8 million
- 7.7 million people <u>still</u> do not have access to mains electricity
- 2010-30 Integrated Resource Plan for Electricity (revised 2014)
  - 9.6 GW of new capacity from nuclear power

Integrated Resource Plan for Electricity (IRP) 2010 - 30 *revised 2014*



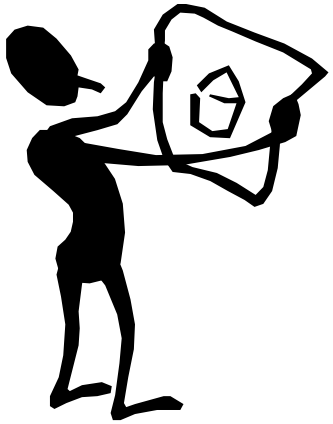
Loss of skills



25,000 skilled professionals will retire from US nuclear industry by 2015 – NEI Report 2011

Dimensions of the task

- How long is a piece of string?
- Necessary to develop a number of assumptions to assist in putting numbers and costs to the project
- 2013 The Nuclear Industry Association of South Africa published "*NIASA Educational Sub-Committee Report on Skills Requirements for the Proposed Nuclear Build Programme*"



Assumptions

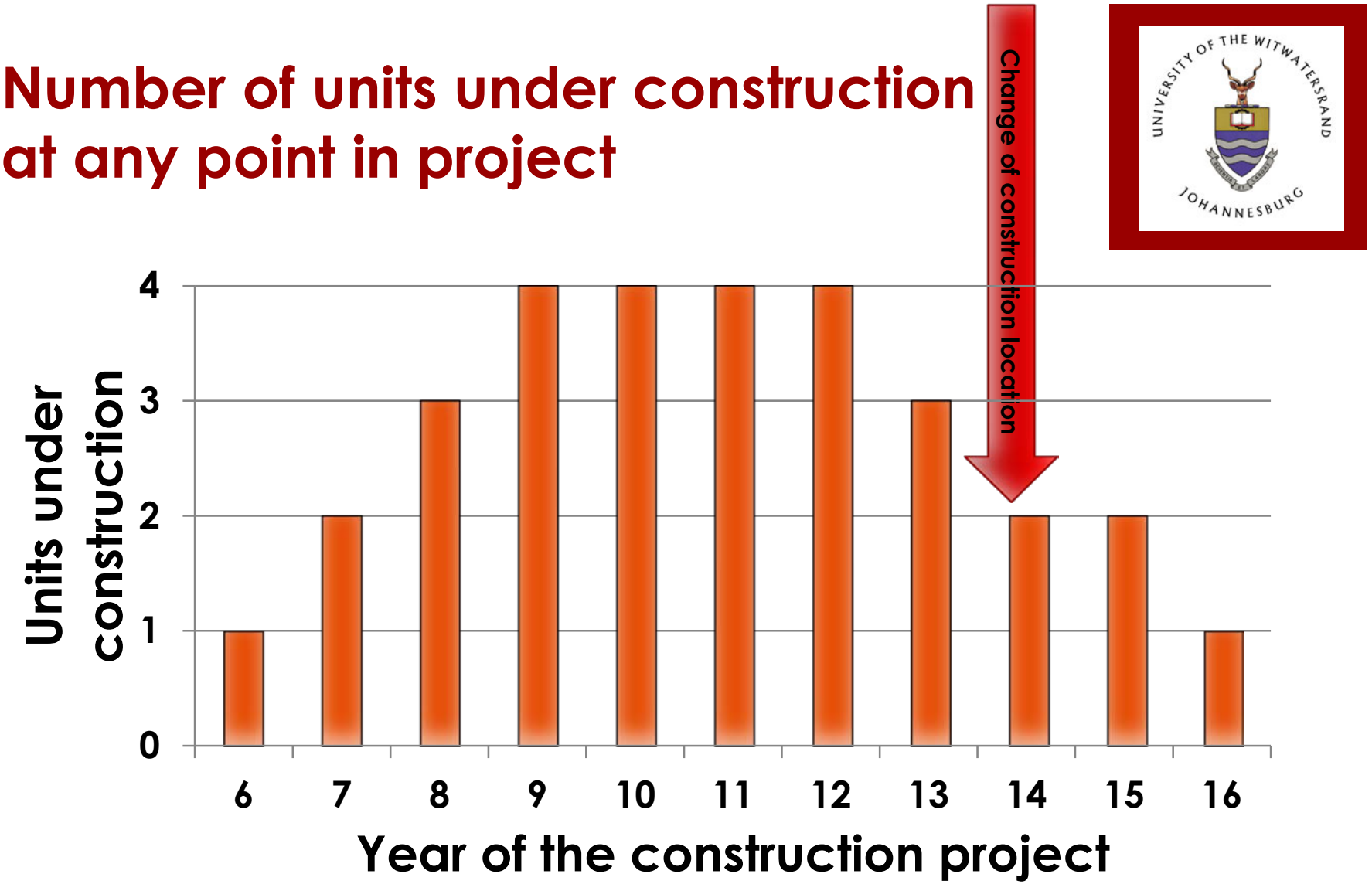
1. New Build will consist of 9.6 GW
2. Four reactors to be built at one site – Thyspunt with common management & two reactors will be built at Koeberg (the existing site of npp) but with separate management
3. Fleet will start as EPC contract moving to a EPCM contract by fifth unit (increasing localisation upto 40%)
4. No legal challenges/delays
5. Eskom will be owner/operator
6. Nuclear reactor technology neutral – no preferred vendor currently selected
7. Schedule is as follows;

Construction Schedule – 9.6 GW (six units)

			Project year																	
Number of Unit	Capacity MW	Commissioning year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1600	12																		
2	1600	13																		
3	1600	14																		
4	1600	15																		
5	1600	17																		
6	1600	18																		

	Pre-project, planning
	Site preparation
	Construction
	Commissioning & testing
	Operation

Number of units under construction at any point in project



Peak labour requirements will be from years 9 – 12 of construction project

Adjusted construction labour requirements in South Africa

- South Africa has always had a traditional work practice that has been labour-intensive rather than capital-intensive.
- In developing meaningful labour numbers this needs to be reflected in calculations based on OECD/US labour numbers
- Regional multiplier of 2.15 developed*

SA's construction labour requirements

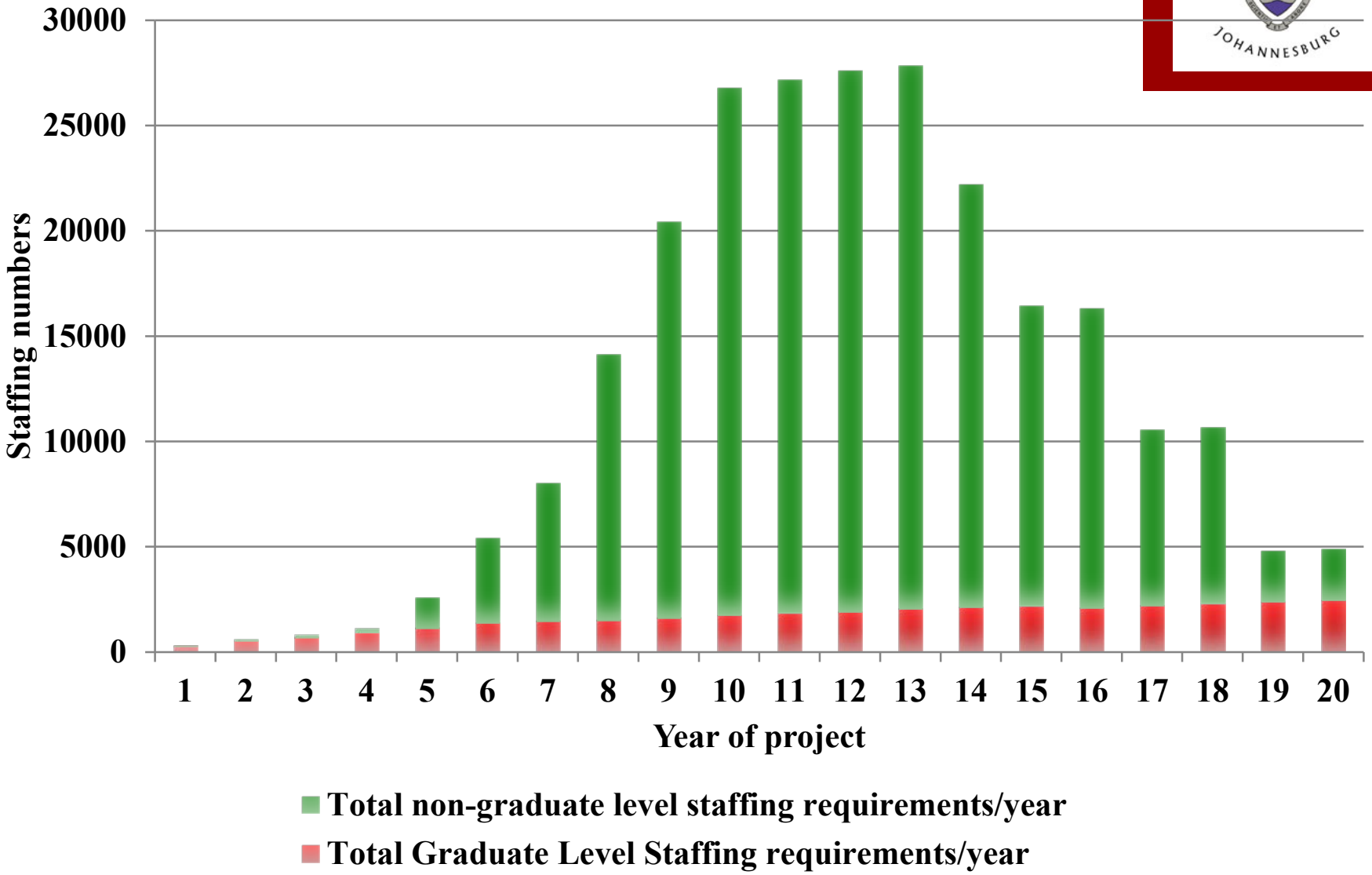
- **Using US DoE figures* for construction of 1000 MW PWR-type unit and assuming for every five construction jobs there is an additional one support member and adjusted with regional multiplier, it is estimated peak on-site labour numbers per unit under construction will be in the order of 5630 personnel. This includes 'balance of plant systems (BOP)'. BOP systems include warehouses, water treatment systems, admin buildings etc.**

- **D'Olier, R (2005) DOE NP2010 Nuclear Power Plant Construction Infrastructure Assessment Report*

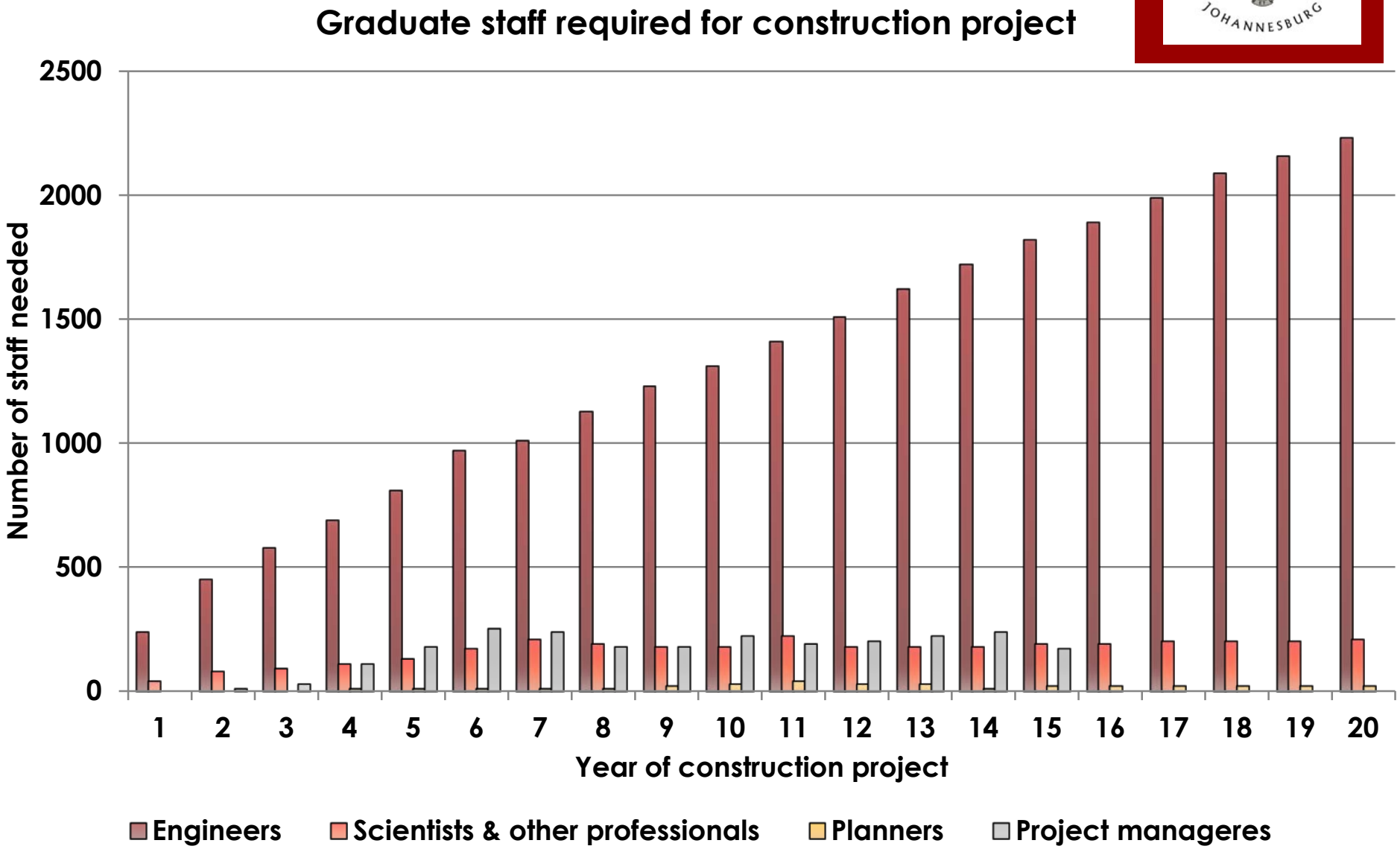
Peak 'On-site' labour requirements – single 1000 MW PWR-type unit

Job Type	Peak average personnel
Craft labour – artisans & technicians	4140
Craft supervision	210
Site indirect labour	410
Quality control inspectors	100
NSSS Vendor and subcontractor staff	360
EPC Contractor's managers, engineers and Schedulers	260
Start-up personnel	150
Total	5630

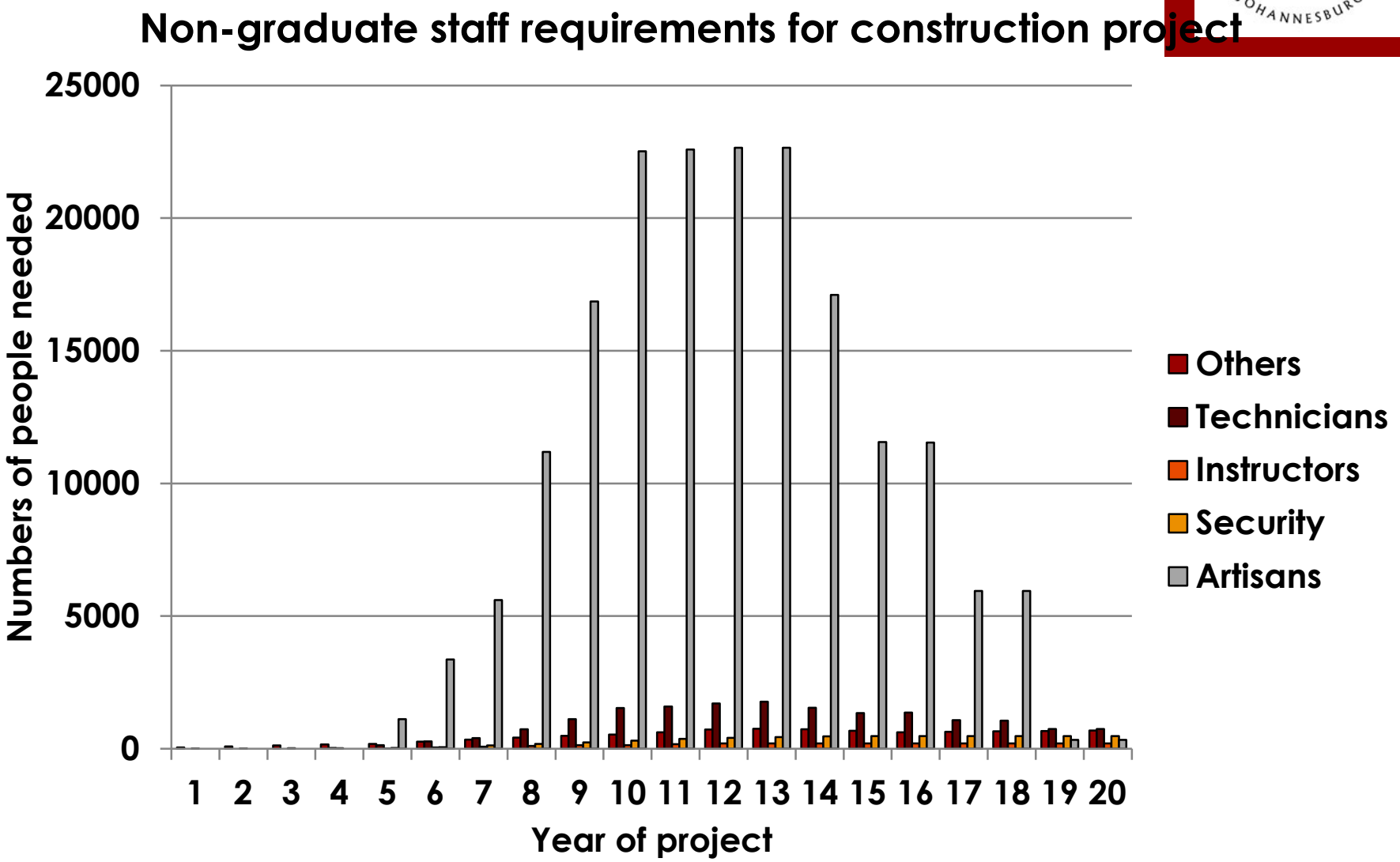
Projected Staffing Numbers



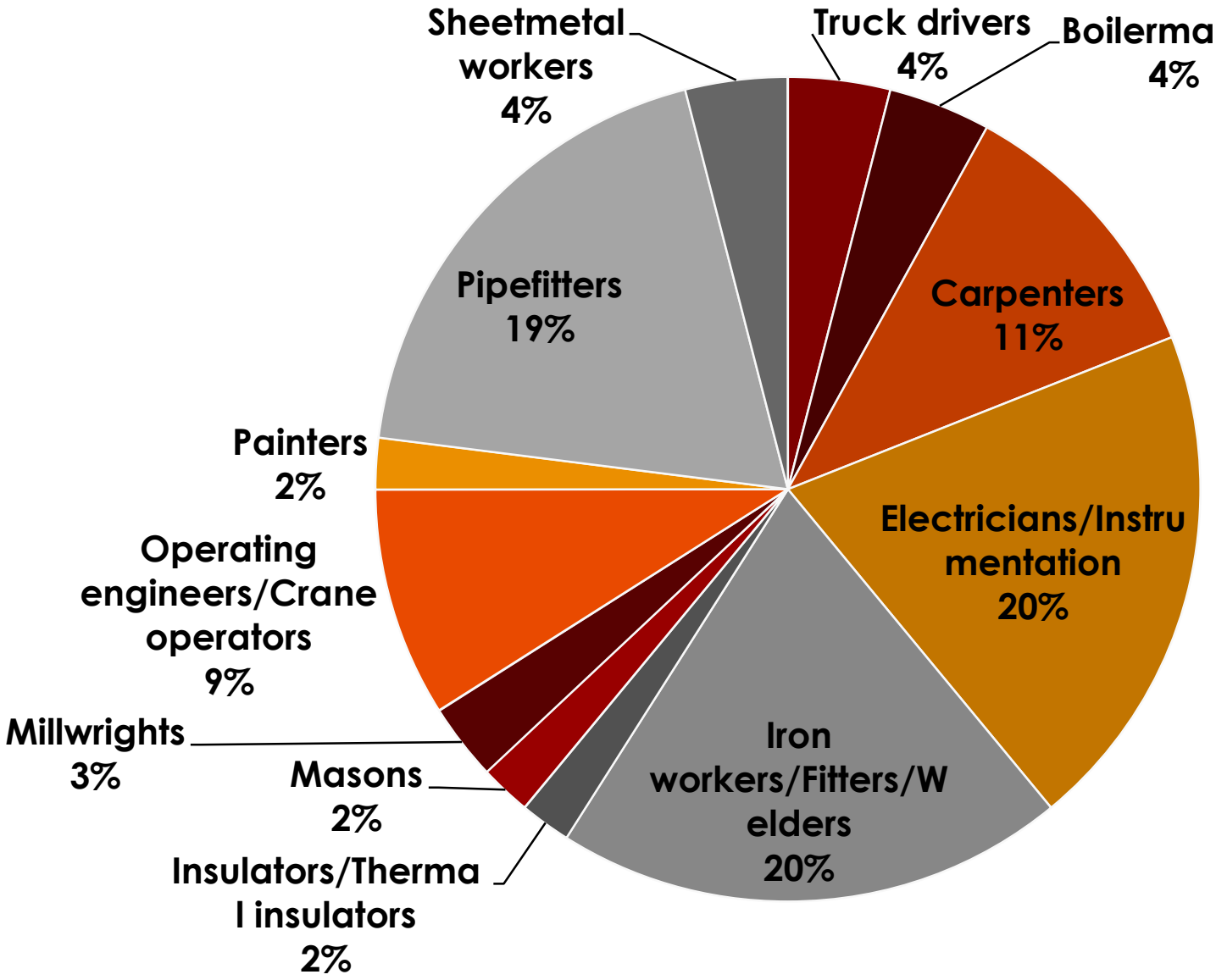
Graduate staffing needs



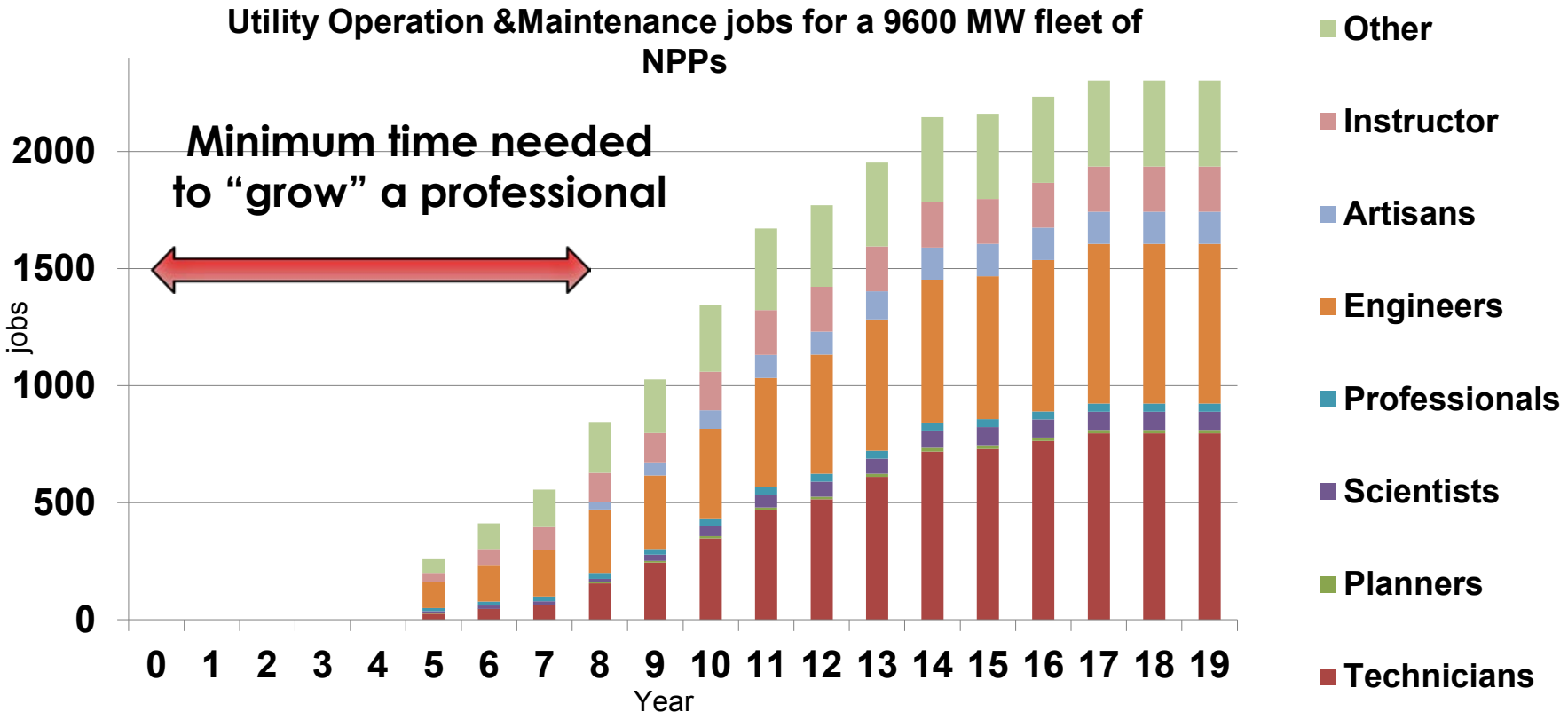
Non-graduate staffing needs



Breakdown of required Artisanal Skills



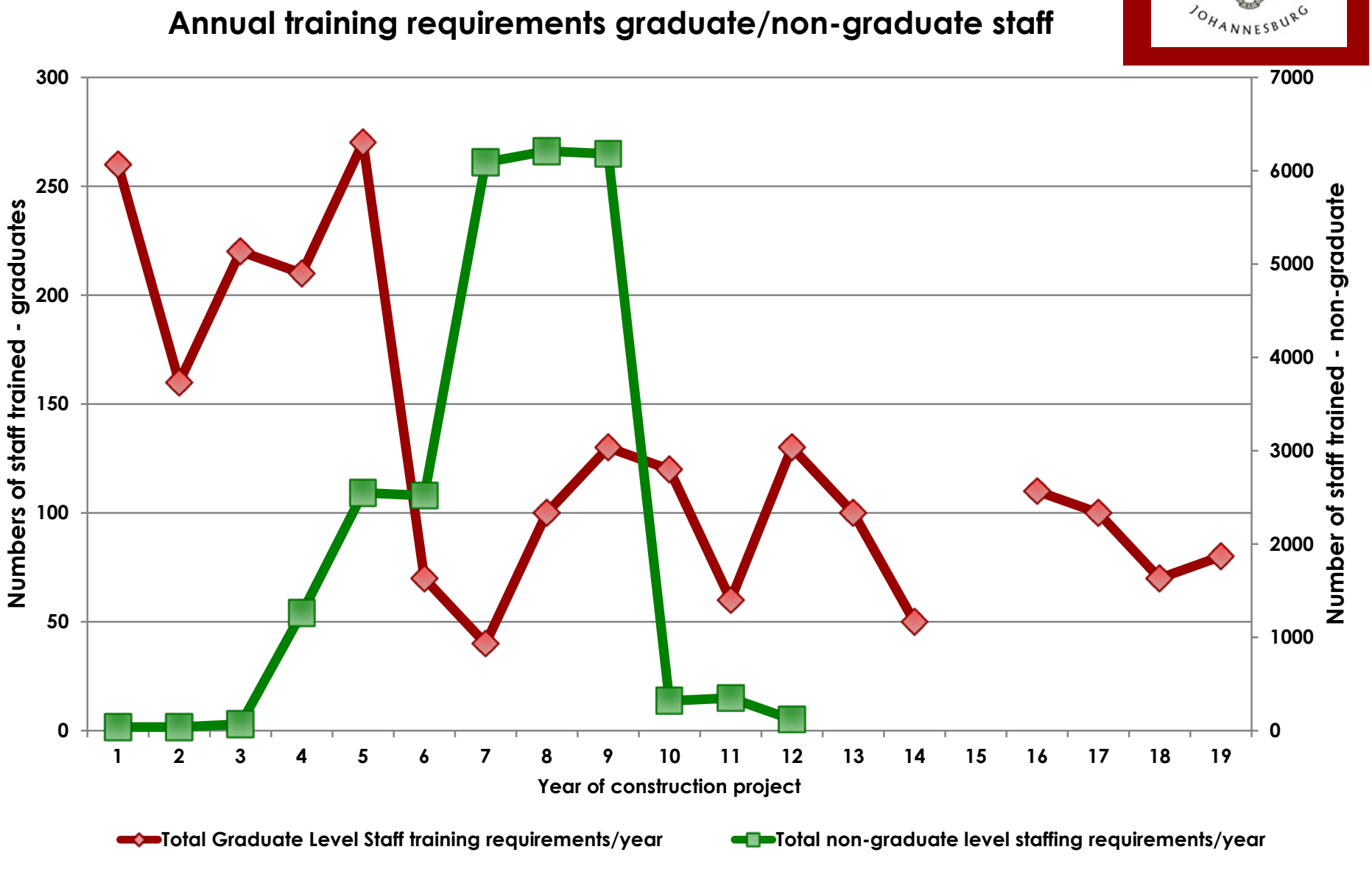
Operating and maintenance staff for the new npp's



Training & Educational Initiatives

- Two clear educational streams required
  - Graduate level – engineers, scientists, and senior/middle management
  - Artisanal/Technical level – craftsmen responsible for the actual construction of the plants

Annual training requirements



Graduate level education

- University of the Witwatersrand – graduate & undergraduate programmes
- Northwest University – postgraduate programmes
- Pretoria University – postgraduate programmes
- University of Cape Town – postgraduate programme
- University of Johannesburg – postgraduate programme

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

University of Pretoria

University of Cape Town • iYunivesithi yaseKapa • Universiteit van Kaapstad

UNIVERSITY OF JOHANNESBURG

Technical/Artisanal Training

- Critical shortage of FET places, experiential training, and apprenticeships – issue that doesn't only effect South Africa
- Eskom
- Necsa
- Further Education Colleges???

Summary

- Universities can probably produce the required numbers of graduates on time, provided they start developing them now.
- Technical/artisanal training requires significant work to develop the necessary capacity to develop/grow the local skills base necessary to bring the project to completion on time and within budget