MTEC MINING ENGINEERING EDUCATION INITIATIVES IN AUSTRALIA

Bruce Hebblewhite
School of Mining Engineering
The University of New South Wales (UNSW), Australia

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What is MTEC?

- Minerals Tertiary Education Council
- An initiative of the Minerals Council of Australia (MCA)
- Focussing on three core disciplines
  - Mining engineering
  - Earth Sciences
  - Metallurgy

MTEC – Mining Engineering

A collaborative partnership between the three principal Australian providers of tertiary mining engineering education

- The University of New South Wales (UNSW)
- The University of Queensland (UQ)
- Curtin University: West Australian School of Mines (WASM)

Outline of this presentation

- Background to the formation of MTEC in relation to Mining Engineering
- Summary of recent achievements
- Future initiatives/opportunities
  - national
  - international

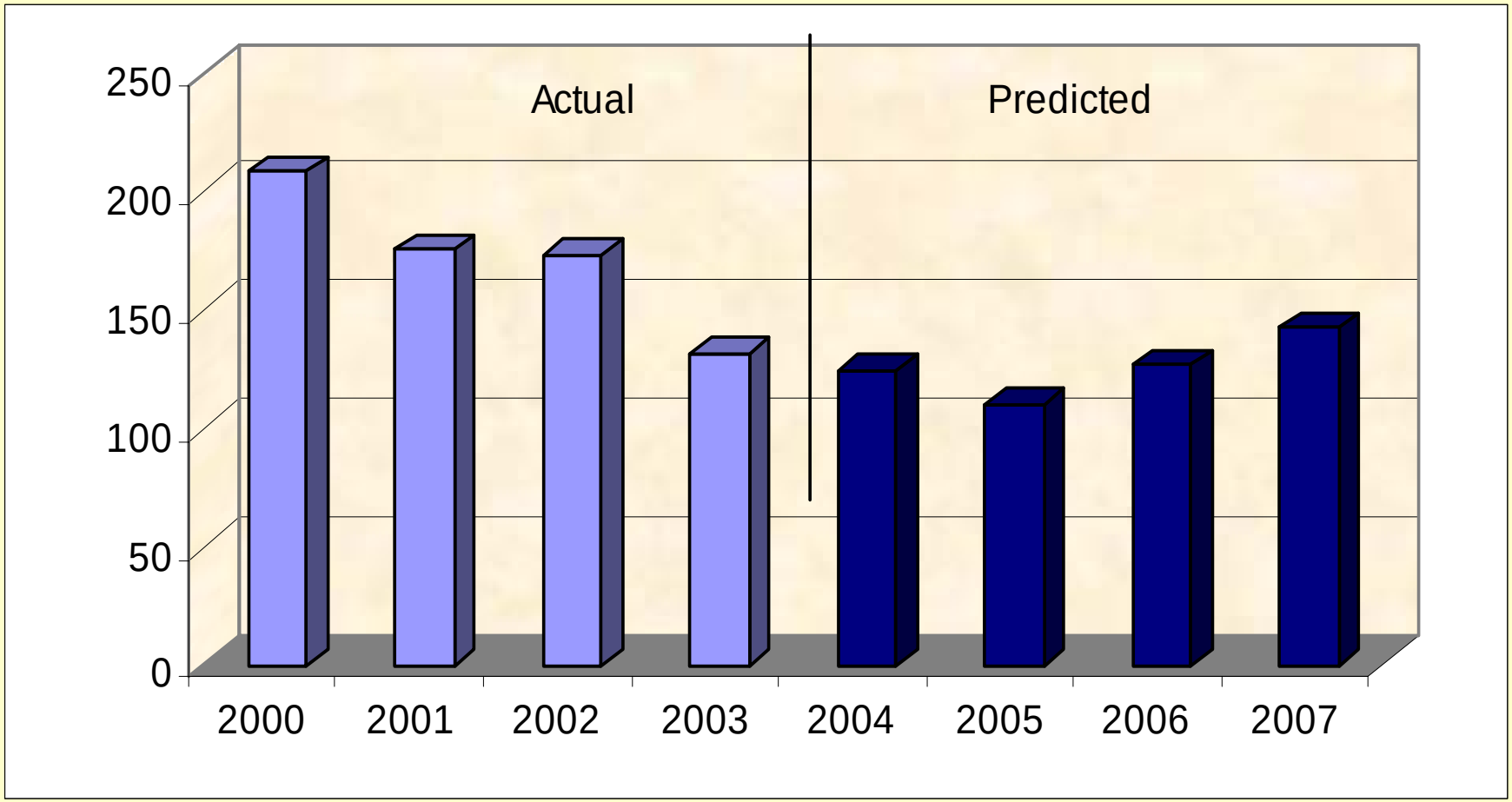
Background

- The Australian minerals industry is a major component of national economy
- It is an export-dominated industry
- Export commodity prices are at all-time highs
- Industry involves a small number of large multi-nationals
- Industry has good prospects for a long-term, sustainable future
- BUT – it is desperately short of qualified professional staff, particularly mining engineers
- This shortage is reflected internationally

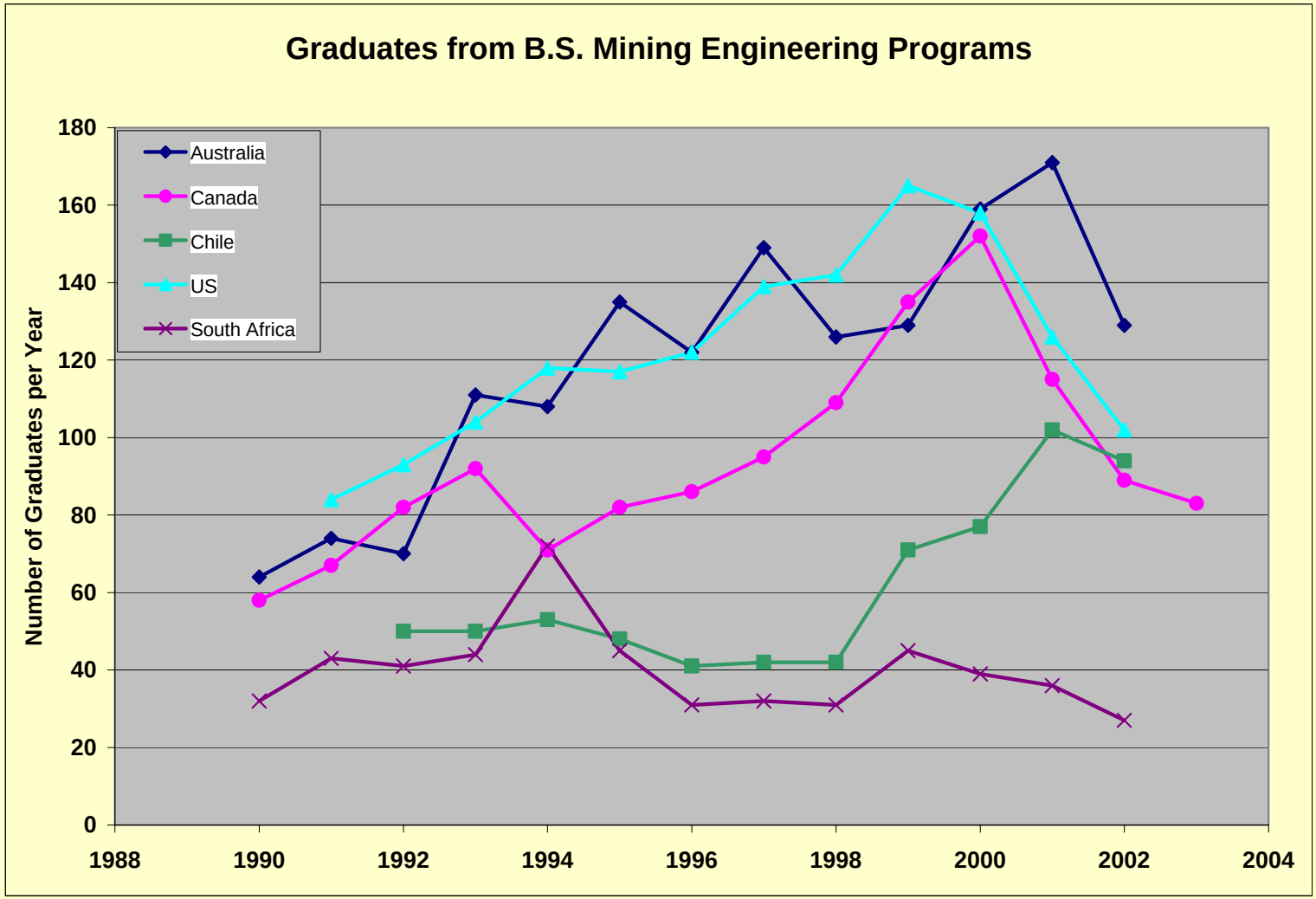
Graduate shortages

- Currently in Australia, supply of mining graduates is approximately 33% short of demand
  - 100 graduates in 2004
  - Industry demand running at 150
  - Need to increase graduate numbers by +50% to cater for future growth
- Internationally, situation is even more critical

Mining engineering graduates (national figures *(after Tuckwell (2004))*)



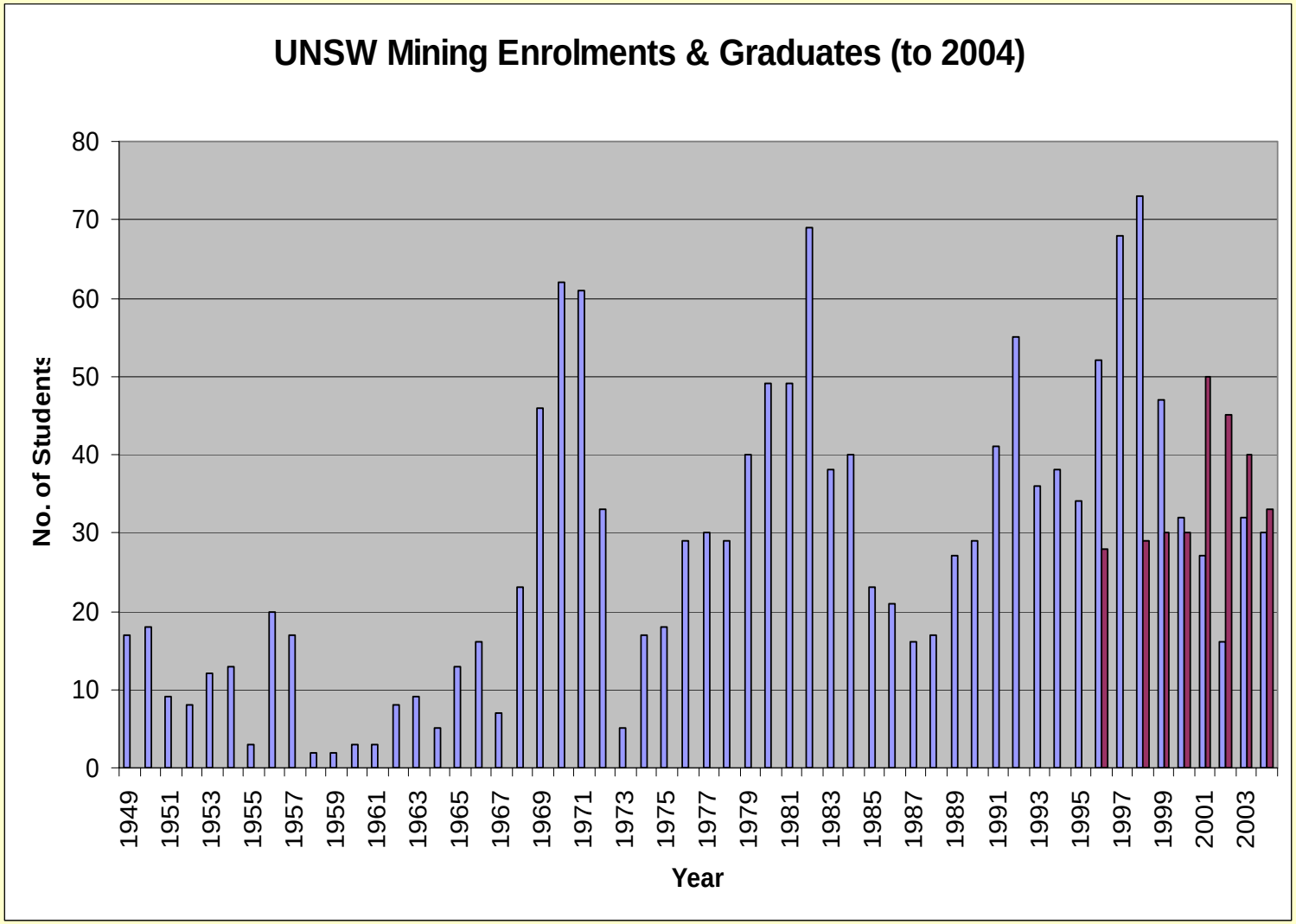
International mining graduate numbers *(after Knights (2003))*



Is this just a cyclical trend, reflecting industry fortunes?

Will it come good in response to the current buoyancy of the mining industry?

Historical enrolment records (UNSW Mining Eng.)



Historically, these enrolment cycles are characterised by a 6-8 year rise period and 2-3 year decline.

Average UNSW graduate numbers (2000-2004) is 40/year

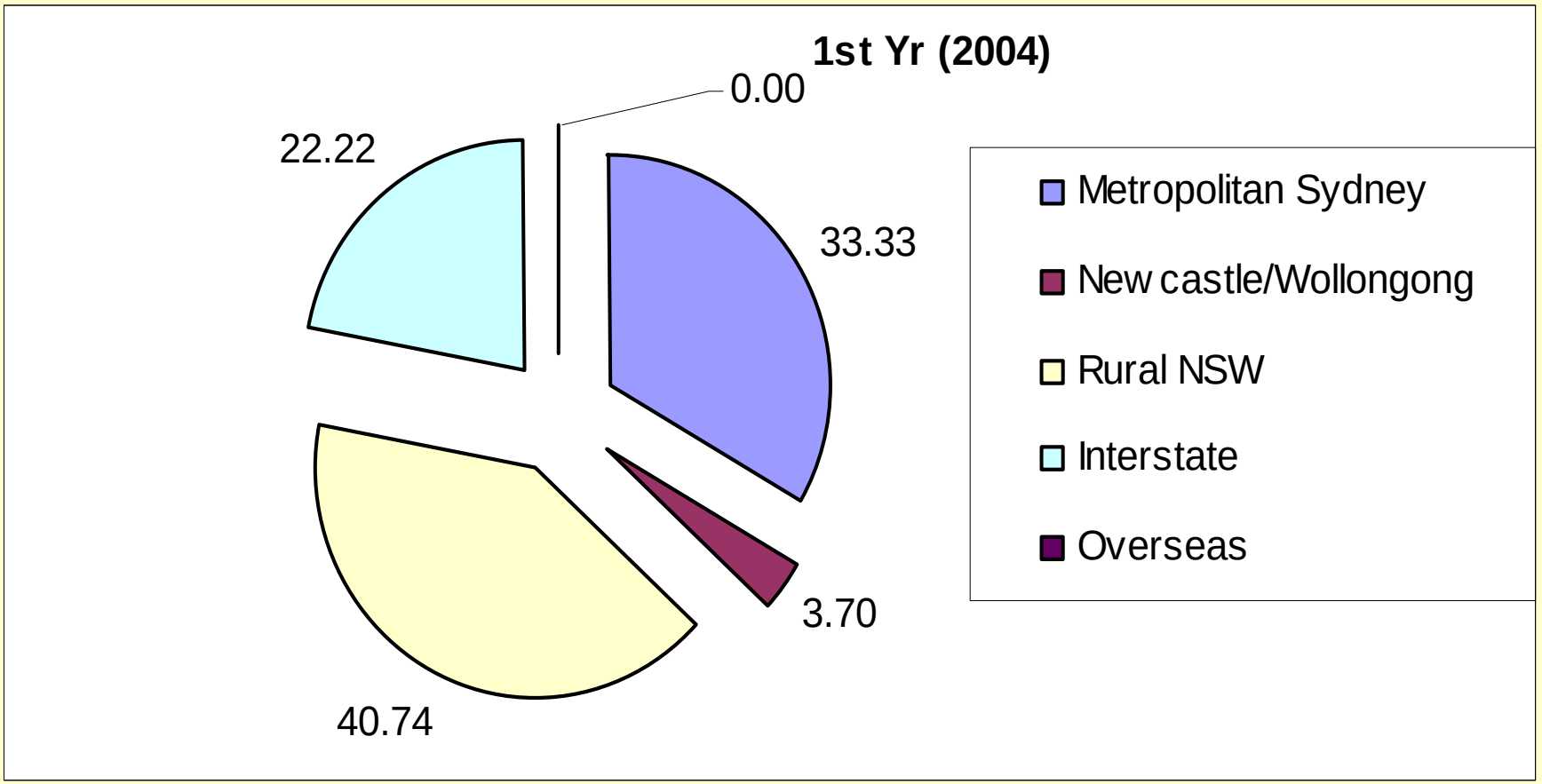
Is this just a cyclical trend, reflecting industry fortunes, and will come good in a couple of years?

- NO
- There may be modest increases in numbers, as seen in 2005, but not to the extent of a 50%+ improvement
- University student numbers are currently at sub-critical levels
- Mining Schools are closing due to sub-economic numbers and lack of suitable staff

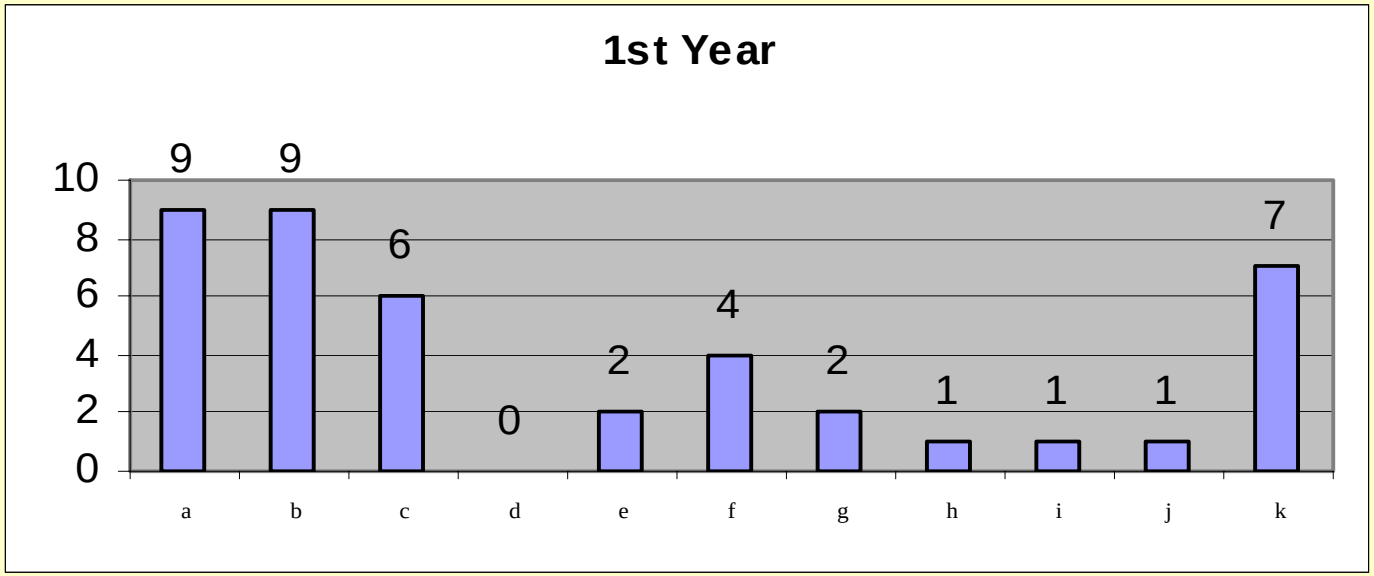
Student intake

- We need to recruit more students
- 2005 total new intake across Australia is improving (approx. 140) – but is still well below demand
- Need to overcome poor industry image of *"old technology/dirty/environmentally unfriendly"*
- Need more targeted school student recruiting

Many UNSW students are from rural and regional areas



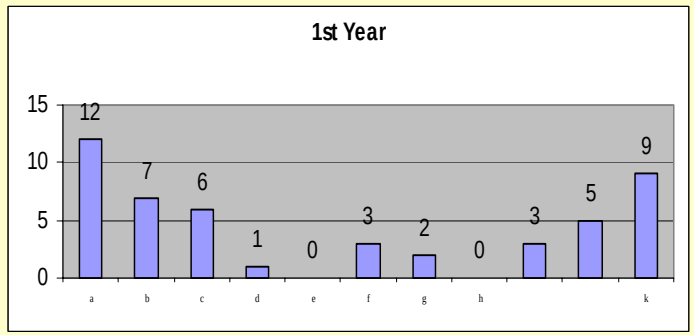
Student Survey Q5. My first real interest in pursuing Mining Engineering was triggered by:



2004

a. Friend or relative in the mining industry
b. A visit to a mine
c. Attending a UNSW Open Day
d. Attending a UNSW Careers Day in my region
e. Visiting the School of Mining Engineering at UNSW
f. Advice from my School Careers (or other) teacher
g. Presentation by UNSW or other Mining person, at my School
h. Hearing or seeing the 2003 TV advertisement by UNSW Mining
i. Attending an ASMV or MSS Summer School run by UNSW
j. UNSW School of Mining Engineering website
k. Other

2003



Background summary

- Industry is desperately short of graduate mining engineers, and this problem will only get worse, under a “status quo” educational provider situation.
- Universities are struggling to recruit students, albeit with some very recent modest upturns apparent.
- Community views of mining industry as a future career option are largely negative or misinformed.
- University Mining Schools are struggling to survive financially.
- There are few prospective future academics to maintain the education process for the future.

Something has to change

We cannot continue doing more of the same

MTEC – Mining Engineering

The MTEC objectives, established in 1999, on behalf of MCA and the industry at large, were to improve both quantity and quality of graduate education – not due to existing poor quality, but with a view to achieving:

- a better focus in education programs;
- achieving greater consistency in graduate education, regardless of source institution; and
- improving balance of technical components plus professional elements of management, sustainability and industry/engineering practice.

MTEC Mark I: 2000-3 (Mining Engineering)

- UNSW +WASM+ UQ
- New “expert” shared course modules
- MTEC Lecturers (early career academics)
- Coordinate industry work experience
- Coordinate postgraduate coursework

MTEC Mark 1 achievements

- 3 universities agreed to collaborate
- Undergraduate coursework resources developed for
  - Rock mechanics
  - Mine planning
  - Ventilation
- Courses or modules within courses being taught by staff from other universities
- Postgraduate web-based ventilation Graduate Diploma developed for distance delivery

MTEC Strategic Plan 2004-6

1. **Increase in undergraduate student numbers**
   - Number of students entering programs *+30 %**
2. **Increase in postgraduate student numbers**
   - Coursework for award enrolment *+50 %**
   - Coursework not for award (CPD) enrolment *+50 %**
   - Research - total enrolment *+ 10 %**
3. **Deliver MTEC courses to international market**
   - International undergraduate enrolments +10%*
   - International postgraduate enrolments *+30 %**
4. **Grow proportion of students from MTEC programs**
   - MTEC proportion of student cohort *+80 %*
5. **Increased viability of institutions delivering world-class teaching in the core disciplines**
   - Graduates employed from MTEC universities *> 80%*

MTEC Mark II
Mining Engineering

- MTEC Lecturers
- Coordinate industry work experience
- *Pathways* – postgraduate programs
- Build an Australian mining engineering program (*Mining Education Australia (MEA)*)

  → address quantity and quality

Build an Australian mining engineering program (Mining Education Australia (*MEA*))

- Needs quantum change, not just incremental change

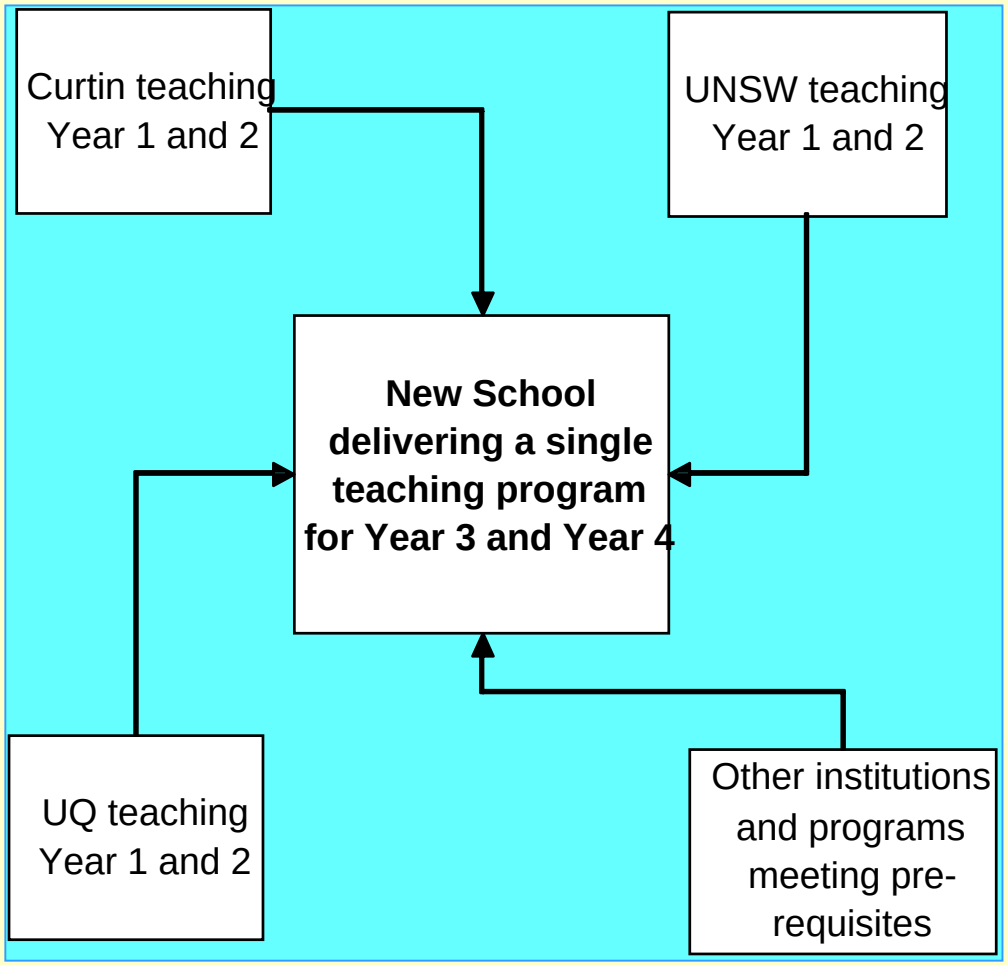
MEA National Mining School – the Vision

"One Program and one School delivering a world class program of undergraduate education in mining engineering by integrating and coordinating the resources of Australia's premier mining universities."

Perceived benefits of *MEA*

- Students taught by subject matter experts, regardless of institution
- Better staff utilisation
- Improved quality programs
- Economic sustainability of institutions achievable
- More course electives and flexibility for students
- Program more attractive for student recruitment
  - Exchange options
  - Quality, industry (future employer) endorsed programs
- More attractive program - more graduates

Proposed national “School” - *MEA*



MEA would focus on teaching 3rd and 4th Year of the mining engineering program.

Partner institutions would continue to manage:

- student enrolment and fees,
- staff employment,
- 1st & 2nd year teaching, and
- awarding of degrees.

National “School” attributes

- Unincorporated JV between universities to teach single program for years 3 and 4. A new entity and cost centre made up of three Nodes.
- Intended to provide both increased quality and quantity of graduates (nationally and internationally)
- National course syllabus and content
- Common assessment process
- Course Convenors for each course, with local node support staff.
- Each course structured to suit distribution of expertise and resources between the Nodes on a case by case basis.

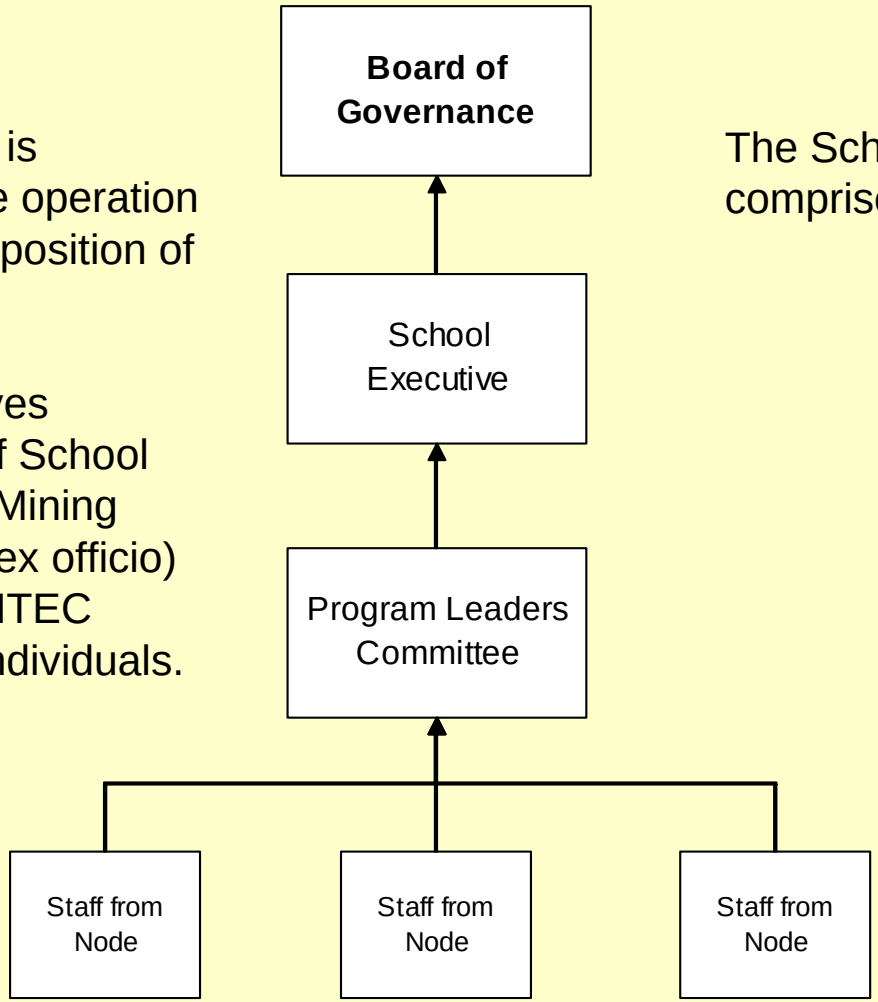
National “School” attributes (cont’d)

- Multiple “delivery” options using subject-matter experts
- Wider range of elective options - 3 providers (economies of scale)
- Elective courses designed to allow “branding” (characteristic differences between graduates from each Node) to be maintained and to accommodate needs of dual degree students.
- Improved, collaborative learning environment
- Student exchange options facilitated

MEA management structure

A Board of Governance is proposed to oversee the operation of the School. The composition of the Board should be:

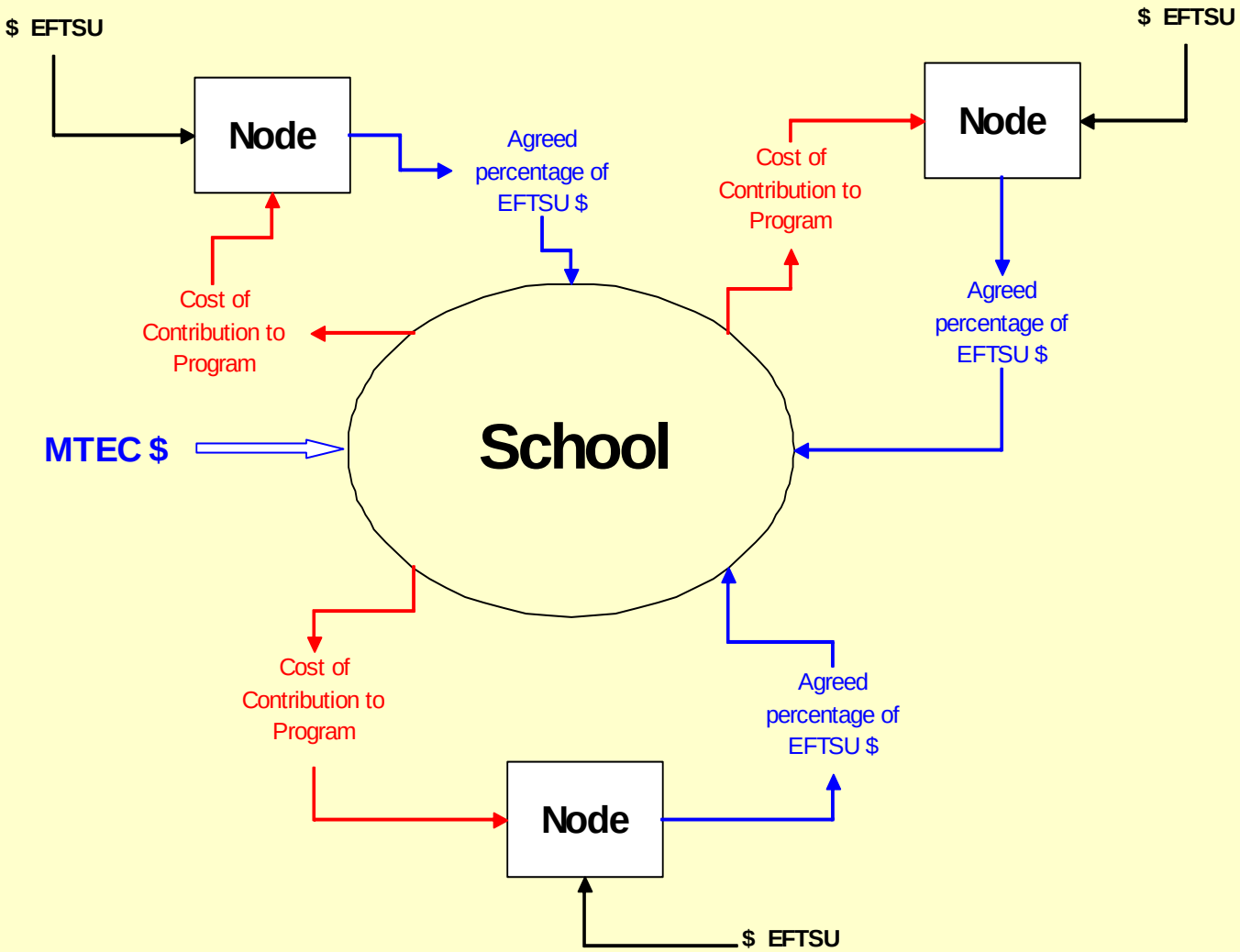
- 3 x University Representatives
- 1 x Director of School
- 2 x Heads of Mining Engineering (ex officio)
- 1 x Chair of MTEC
- 3 x Industry individuals.



The School Executive should comprise:

- 3 x Heads of Mining Engineering
- 1 x Executive Director of MTEC
- 1 x Chair of Program Leaders Committee

Conceptual cash flow model



Critical dates for implementation

- MTEC approval to develop Proposal – June 2004
- submission of Proposal – November 2004
- approval to establish the School – Q1, 2005
- approval of Program and Courses – Second Half 2005
- Program and Course details in University Handbooks – March 2006
- transitional year – 2006
- full Implementation – 2007.

International opportunities

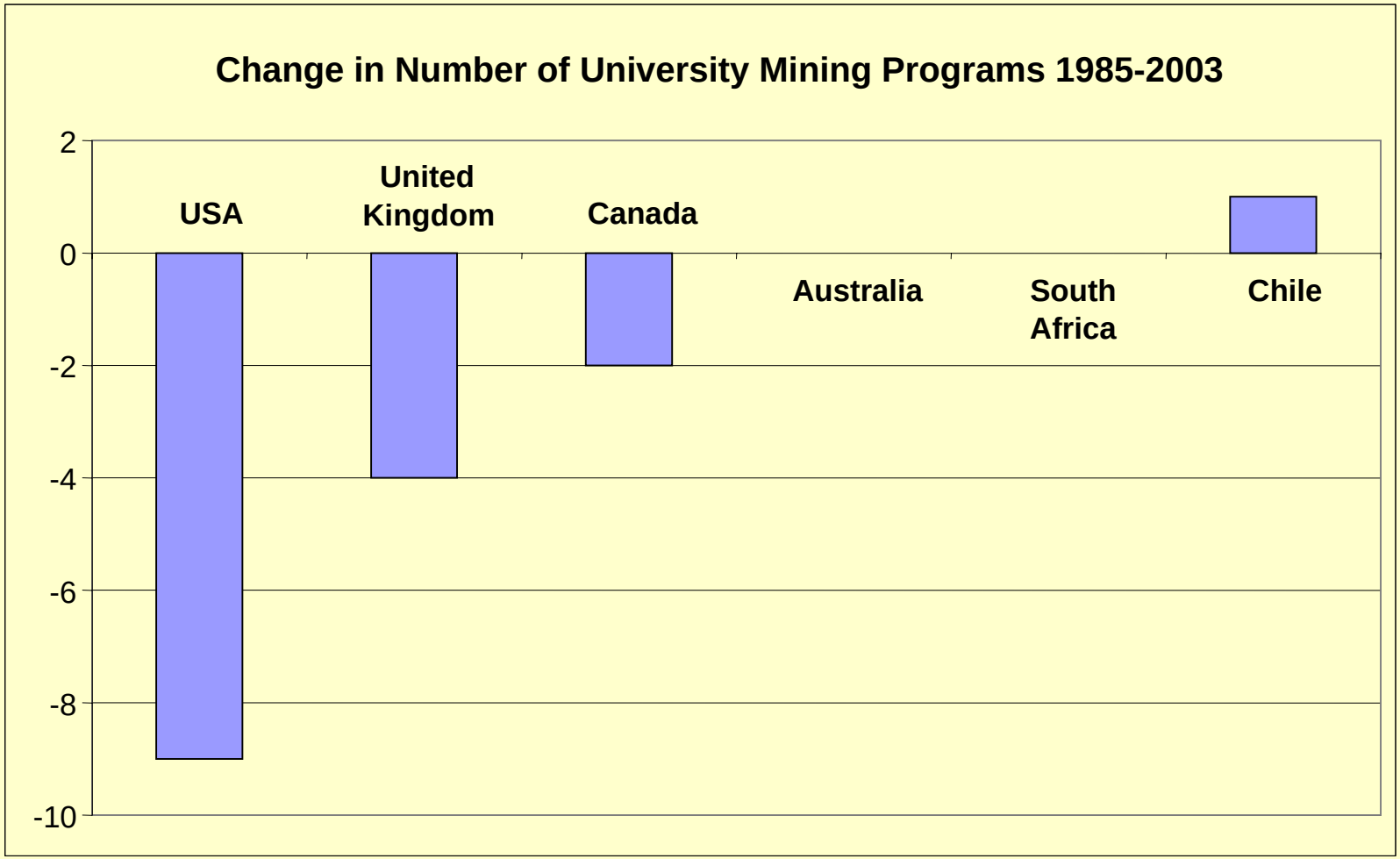
What is the situation internationally?

International background situation

- South Africa - strong student numbers, but unique issues.
- Canada has eight mining engineering providers at present, with recent, modest increases in student numbers, albeit probably still marginal or below sustainable levels, long term.
- Europe has the European Mining Program, but modest student numbers and limited industry access.
- US Mining Schools – low numbers, further closures?
- South America is relatively active with multiple schools, but limited numbers.
- India/Asia – unknown situation/potentially large opportunity.
- Fewer, but larger mining companies - a global minerals industry, both by being multi-national entities, and also by a greater willingness to recruit and move personnel on an international playing field.
- Internationally, community perception of the global mining industries continues to be one of *"old world", "dirty", "unsafe", "low technology", "sunset industry",* etc.
- There is an extreme shortage of mining engineering academics for the English-speaking world – expected to deteriorate further, to the point where this will force further closures. This poses serious threats to the long term viability of current academic institutions – both for teaching and research.

International mining program closures (1985 – 2003)

(after Knights (2003))



An International Mining Education Network (IMEN)

- Just as in Australia, the “status quo” is not a sustainable solution
- Industry needs to recognise these needs and be part of a long-term strategic alliance with educators
- There may be opportunities to provide greater international sustainability of education providers, and satisfy industry graduate needs into the future, through the formation of some form of loosely connected provider network (?IMEN)

What could IMEN consider and facilitate?

- Expanded cross-recognition of programs, and greater student exchange.
- Recruitment of international students into core IMEN provider programs – particularly students from non-IMEN geographic locations. These would be students who might otherwise be "lost" to the minerals industry.
- IMEN providers to act as outlets for shared teaching resource material.
- IMEN to facilitate exchange teaching arrangements with other members where expertise is inadequate or not available (permanently or temporarily) - physical relocations, short courses at other sites, plus distance mode delivery, etc.
- Future development of new shared course materials.
- Participation in establishment of international degree programs, where modules can be taken at any of the member partners.
- Use of appropriate internet provider organisations for dissemination and/or management of components or pre-requisite distance delivery modules.

Where is IMEN up to?

First preliminary workshop to be held here tomorrow.

- **International Mining Education Planning Session**
- **SME2005 – Salt Lake City, USA**
- **Tuesday 1st March, 2005: 9.00am – 1.00pm**
- **Room 150C, Salt Palace Convention Center**
- **Who should attend?**
  - Any mining engineering educators and interested industry personnel who are willing to become actively involved in fostering greater international collaboration.

Conclusions

- The future of mining engineering education requires change, both in Australia, and internationally.

- There are significant opportunities, provided educators and industry commit to a long term, strategic approach, together – an approach that will be sustained through the bad industry times as well as the good.

- The educational cycles are longer than the historical mining economic cycles. Failure to maintain the educational reform initiatives will put at risk the very existence of many educational providers (hence graduate supply) through to the next industry economic cycle.

- The answers lie in national and international collaboration – no one institution will survive alone, and none of these initiatives can be achieved without strategic, and co-coordinated industry participation and support.

Acknowledgements

The author of this paper wishes to acknowledge the ongoing and very significant collaborative activity over the past four years between MTEC and the three partner Mining Engineering providers.

The achievements to date under the MTEC Mining Engineering initiatives, and more importantly the planning for future major collaboration is a direct result of genuine co-operation and collaboration.

The involvement of all academic staff at the three institutions, and in particular, the contribution by Professor Peter Lilly from WASM, Professor Mike Hood from UQ and Dr Kevin Tuckwell from MTEC is gratefully and publicly acknowledged, as is the support from Mr Andrew Scott, contract consultant to the MTEC Mining Program.

Thank you