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20 y 21 de Octubre

5° Congreso
AACE International
de Ingeniería de Costos
PERÚ 2017

(ID) Mining and Mineral Processing Uniform Cost Coding Structure

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Mining companies use their own coding structures for cost estimating and cost tracking, which prevented data-sharing, disabled reliable cost benchmarking, and set barriers on cost controls with contractors. Uniform cost coding structure development is the first step toward finding a solution to these issues.

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BIO of Baqun Ding

- Joined Independent Project Analysis (IPA) in Jan. 2006; is now Business Manager of Mining, Minerals, and Metals
- 20+ years industry of experience as a mining engineering professional before joining IPA
- 5-year teaching at university
- Involved in evaluation of dozens of capital projects from different industry sectors of various sizes and across all continents
- In 2004, I had my first and last guinea pig lunch of my life; since then, I have never been able to feed my son's pets

Questions for You

- How many of you are related to mining industry?
  - **Owner?**
  - **Contractor?**
- If your are an owner
  - **Do you have (internally) a standard cost breakdown structure?**
  - **Do you have a project cost database with great details?**
  - **Do you have a cost control tool that can handle cost reported by different contractors and vendors, and put them in the right buckets?**
- If you are a contractor
  - **What is your experience working with different owners when tracking/reporting costs, or performing project control?**
  - **How many times do you have to customize your cost control tools to make working with owner easier?**

Outline

- ***Introduction***
- The Problem
- The Approach
- The Next Phase

Introduction

- Mining industry lacks a standardized cost and commodity coding structure for asset development projects
  - **Difficult to collect and collate cost data on a consistent and comparable basis**
  - **Preventing effective cost data sharing or cost code mapping to the accounts of a different organization**
  - **Limiting the industry's ability to improve cost performance**
- Oil and Gas (O&G) Industry addressed this gap a long time ago
  - **NORSOK Standard was first developed 1989, standard issued in 2002 for O&G Industry**
- AACE has a recommended practice (RP) for project code of accounts (RP 20R-98), but it is not mining specific

Efforts underway …

- In 2014, a joint industry group was assembled comprised of four major mining companies to establish a common cost coding system for mining and mineral processing projects
- The four companies involved in the effort were Anglo American, Barrick Gold, BHP Billiton, and Rio Tinto
- This presentation outlines the process, key findings, and proposed path forward for a Mining and Mineral Processing Uniform Cost Coding Structure (MMP-UCCS)

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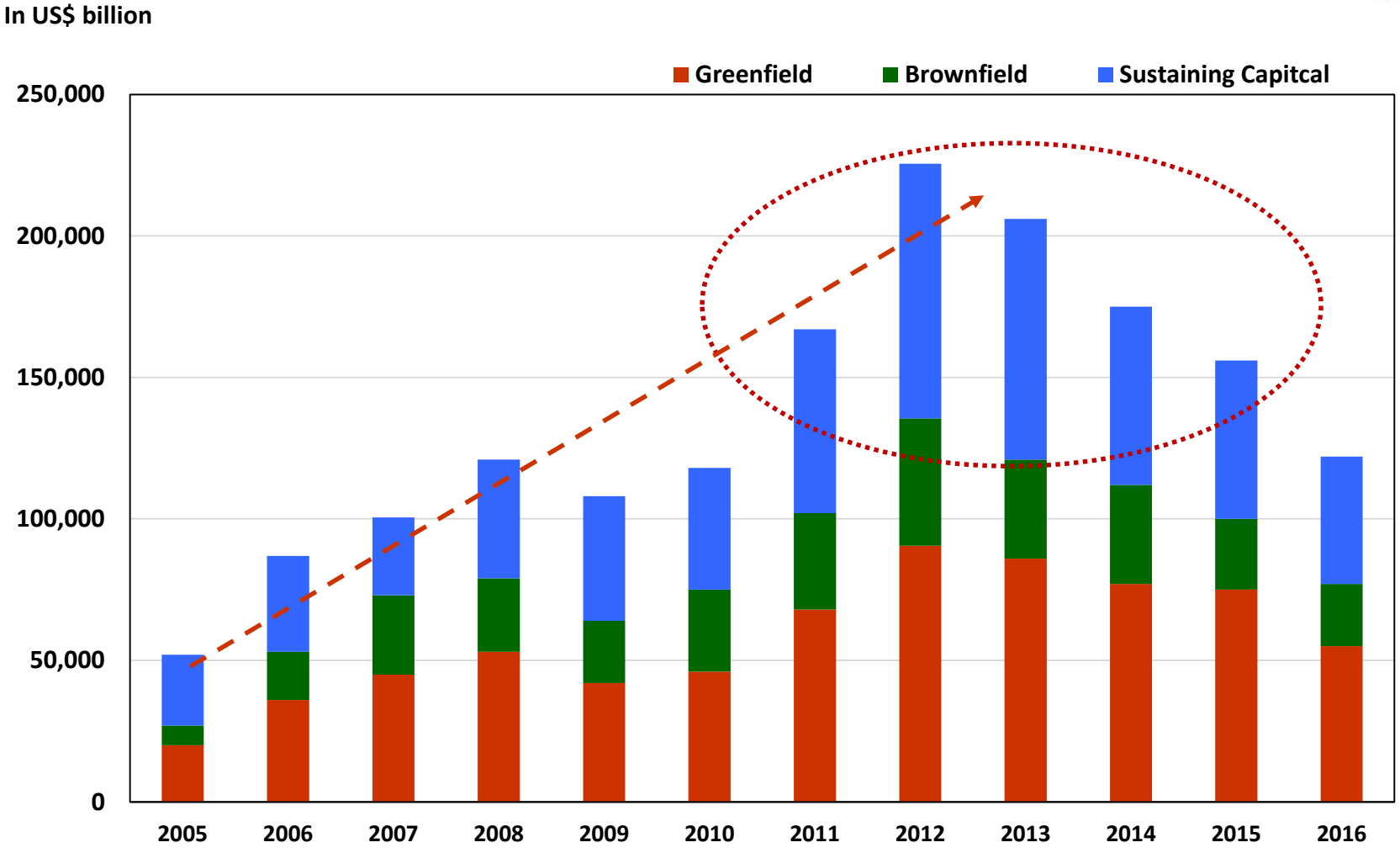
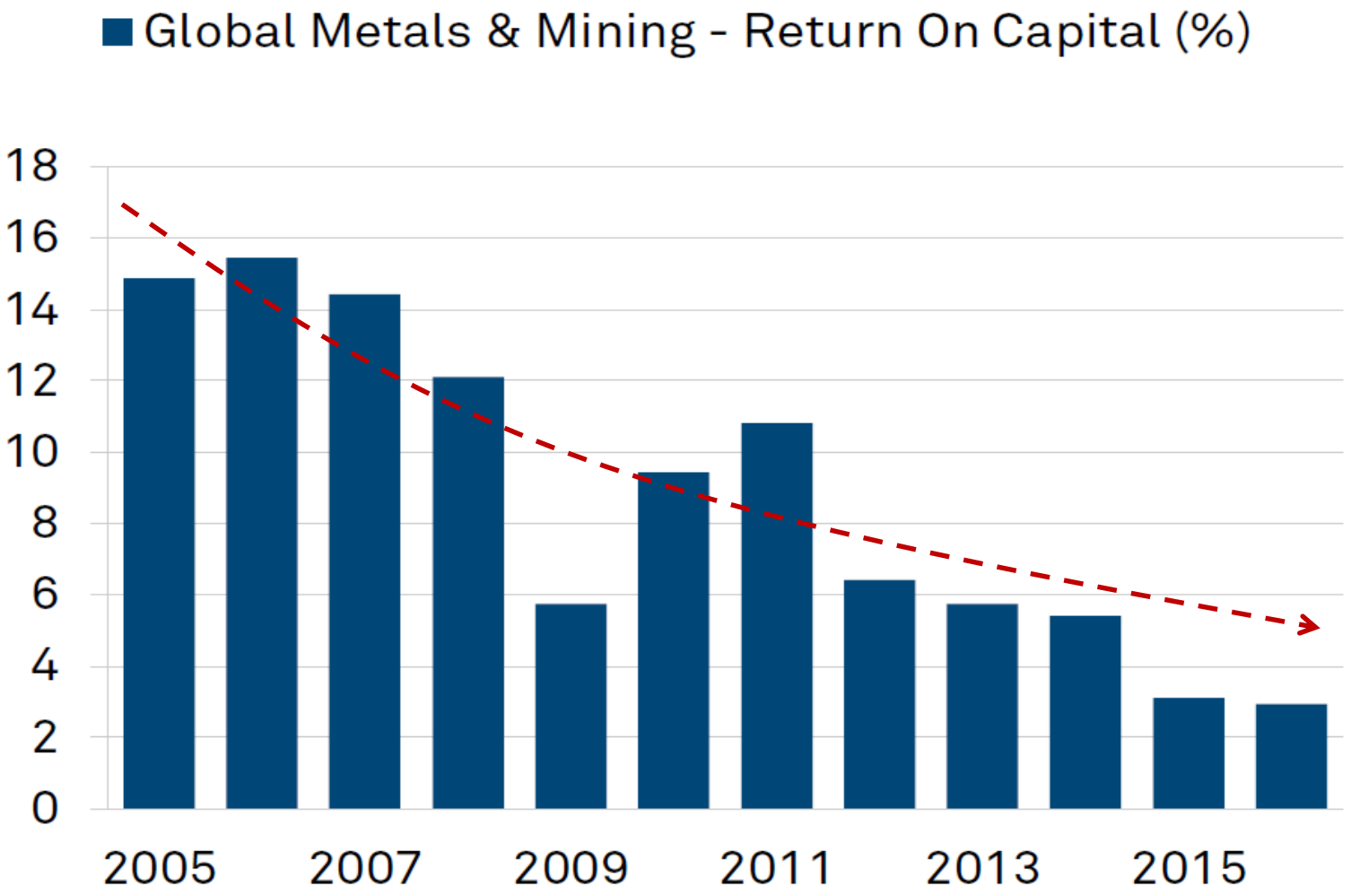
More Capital Spent Over Time



Source: SNL Metals & Mining

Return on Capital Declining—Even During Boom



Source: ***Industry Top Trends 2017—Metals and Mining*****, S&P Global Ratings, February 2017**

Mining Industry Is In Transition

This More Than Just a Cycle!

Urgent Need For Reliable Cost Metrics

- Are we spending too much?
- Are we good at controlling our costs?
- Do we spend our capital wisely?
- Can we benefit from historical cost data?

Reliable comparison to their peers with benchmarking of key development capital, financial, and operation metrics becomes critical

The Reality

- The mining industry is very broad (many commodities and a variety of processes)
- Individual companies have their internal code of accounts
- Most efforts focused on developing an accurate cost estimate rather than how the costs are packaged into work breakdown structures (WBS) and commodity codes

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Steering Committee

- In 2014, a Joint Industry Steering Committee was proposed to establish a Common Cost Coding System (ISC-ECCCS)
  - **Objective: to develop and produce a Mining and Mineral Processing Uniform Cost Costing Structure (MMP-UCS) endorsed by company participants and published by IPA for use and adoption by the industry**
- Various mining organizations globally were invited to participate
- Four companies sponsored the study: Anglo America, Barrick Gold, BHP Billiton and Rio Tinto
- Joint Industry Steering Committee was established with representatives from each of the companies, and was led/facilitated by IPA

The Process

- A charter was developed
  - ***The charter required consensus from members for a recommendation be adopted***
- Existing cost coding structures, including WBS, CBS, and Commodity Coding, were reviewed
- Periodical committee discussion and alignment meetings held to make decision on what to pursue with standardized coding of WBS and CBS

Commodity Coding Structure

- Commodity codes aim to describe tasks performed within a given discipline for a WBS
  - **They form the backbone of a cost estimate, reflecting all scope elements critical to measuring progress**
- Significant variability in industry—especially levels 2 – 3
- Commodity coding standardization was limited to Level 1 Categories
- Letters were used instead of numbers to designate each Level 1 commodity code
  - **Majority of industry participants and project codes had more than 10 categories**
  - **The alpha disciplines also followed the order in which a project is built**

Common Commodity and Distributables Level 1 Outline

Discipline	Level 1	Category	Definition
Civil	A	Earthworks	Geological aspects—site investigation and preparation, excavation, backfilling, etc.
	B	Civils	Site housekeeping—piling, ponds, culverts, roads, etc.
	C	Concrete	Foundation work—in-site concrete, equipment, structure foundations, etc.
Steel/ Structural	D	Steel/Structural	Bones of the operation—stick-builds, safety, non-metallics, etc.
Architectural	E	Architectural	Finishing—floors, ceilings, finishing, plumbing, office equipment, etc.
Mechanical	F	Mobile Equipment	Surface and underground mining equipment, cranes, light vehicles for production, etc.
	G	Mechanical Bulks	Metallic and nonmetallic bulks, insulation, liners, etc.
	H	Mechanical Equipment	Materials handling equipment, pumps, crushers, mills, blending equipment, separation equipment, dryers, etc.
User Defined	J-N	User Defined	User Defined
Piping	P	Piping	Pipes, spooled pipework, monitors, safety equipment, supports, piping insulation, etc.
Electrical	Q	Electrical Equipment	Electrical equipment and fittings—substations, transformers, circuit breakers, junction boxes, SPO/GPOs, security systems, communication devices, etc.
	R	Electrical Bulks	Power cable, control cable, termination, communications cable, fiber optics cable, groundings and lightning protection cable and bulks, heat tracing cable, lighting cable, etc.
Instrumen-tation	S	Instrumentation	Control panels and boards, computerized control systems, programmable logic controllers, instrument bulks, etc.
Indirects	T	Indirects	Non-manual and manual labor, office costs, travel/accommodation expenses, taxes/royalties, financial/legal, insurance, IT licenses, utilities, freight, temporary facilities, EPCM services, study fees, etc.
Provisions	U	Provisions	Escalation, contingency, other provisions

Asset or Works Coding Structure

- Reviewed and tabulated existing coding structures from participants as well from IPA's database
  - **Number of categories for Levels 2 – 4 depended on the project scope**
  - **Review of detailed cost reports from each study participant to understand variations in the degree and extent of generic WBS guideline adoption**
- High Degree of similarity in WBS Level 1 across participating companies
  - **Alignment was required on number of categories, numbering system, and naming of the standardized categories**
  - **Using a four-digit or five-digit coding system was an element of considerable discussion**

Asset or Works Coding Structure

- The committee decided that the WBS coding structure development for this study to go only to Levels 1 – 3
  - **A 9-Level 1 Categories system with a four-digit coding system adopted**
  - **The committee also agreed on basic set of Levels 2 – 3 categories with additional field for industry specific categories**
- Level 4 required significantly more detail, especially given the industry's diversity, and could be the subject of a separate study

Common WBS Level 1

Level 1	Category
1000	Mine/Mining Area
2000	Raw Feed Material Handling/Processing
3000	On-Site Infrastructure
4000	Product Transportation
5000	Off-Site Infrastructure
6000	Common Construction Facilities and Services
7000	Implementation Contractors (Engineering, Procurement, Construction Management)
8000	Owner's Costs
9000	Contingency, Escalation, and Other Provisions

Work Breakdown Code Goes to Level 3

Area Code		Area Description		Description
1000		Mine/Mining Area		Mining area is where the raw ore is extracted and includes mine development, mine equipment, and infrastructure
1100		Open Pit Development		All preproduction costs associated with open pit mine operations
	1110		Prestrip Overburden	Prestripping of waste; includes operators, fuel, and maintenance; ideally collected by mine accounting system
	1120		Mine Stockpiling	Preproduction ore mined and stockpiled before process plant is in operation; includes operators, fuel, and maintenance
	1130		Waste Dumps	Preproduction construction of waste dumps; includes stripping and grubbing, drains and diversions, and toe construction
	1140		Open Pit Mine Development Common Facilities and Services	Facilities or services not covered below that are specifically and exclusively used within the open pit mine
	1150 – 1190		User Defined	User defined
1200		Underground Mine Development		All preproduction costs associated with underground mine access operations
	1210		Access Development	Preliminary costs for access portal, decline, or shaft development; contractor or owner costs
	1220		Mine Stockpiling	Preparation of stockpiles, including clearing, recontouring, lining, drains, and diversions

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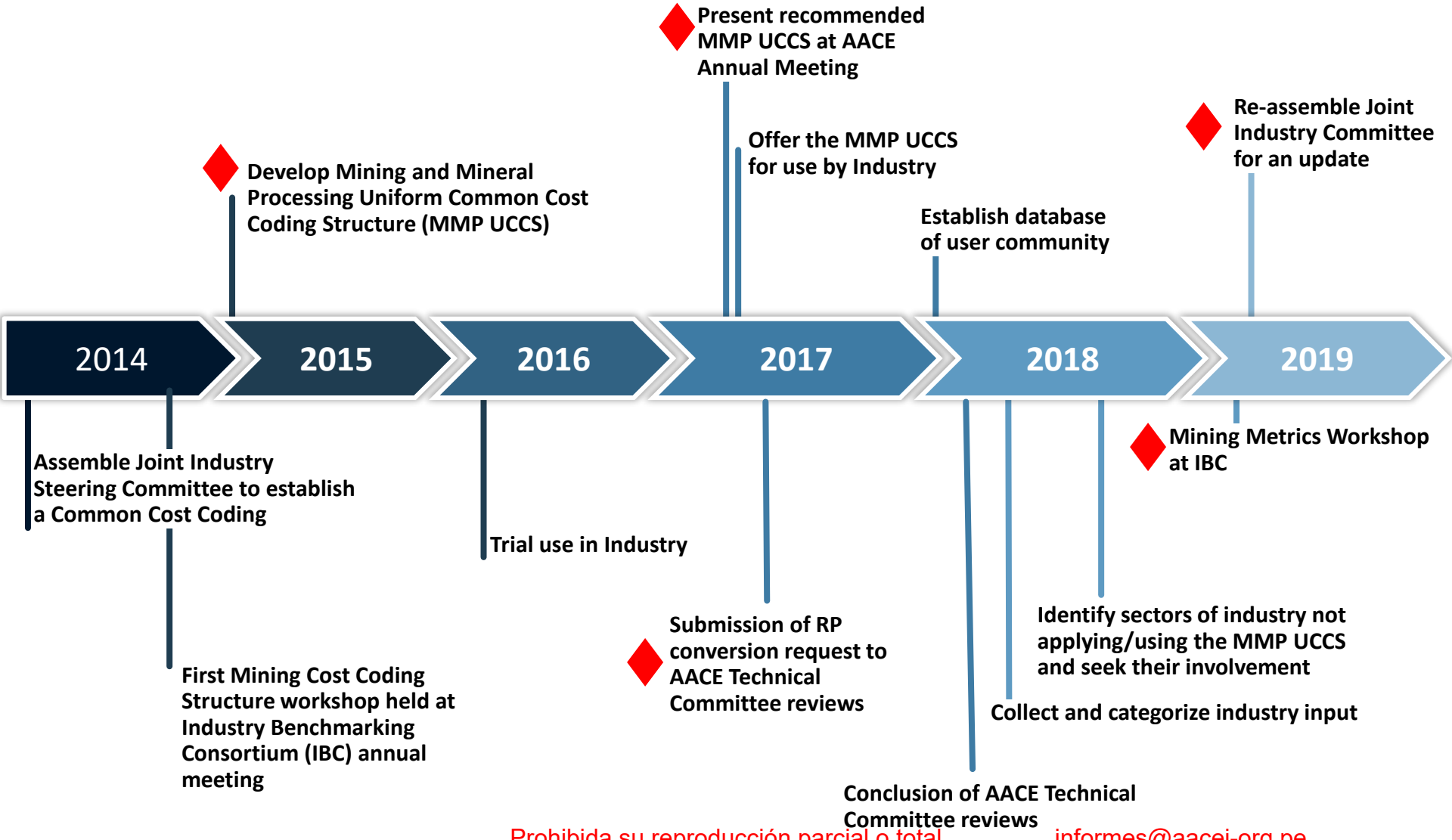
The Vision

- The ultimate vision is for wide-ranging code adoption to facilitate development of mining-specific cost metrics to be used in evaluating and benchmarking mining projects at different levels
- Examples include*:
  - ***Mine development costs ($ million) per ore resource basis (million tons [mt]) (for underground, open-pit, and open-cast)***
  - ***Mine development cost ($ thousand) per pit depth (m) (for open-pit and open-cast)***
  - ***Infrastructure costs ($ million) per mine capacity (mtpy), including ore and waste (for underground, open-pit, and open-cast)***
  - ***Infrastructure costs ($ million) per ore production capacity (mtpy) (for underground, open-pit, and open-cast)***

*IPA Cost Engineering Committee, "Mining, Minerals and Metals Cost Metrics," Independent Project Analysis, 2012, (proprietary).

Path Forward



Conclusion

- The MMP-UCCS represented a significant step in the critical mission of standardizing cost coding structure in the mining and mineral processing industry
- For the effort to really pay off:
  - **Different mining industry sectors, contractors, and investors must now adopt and use the MMP-UCCS**
  - **Better understand cost of mining and mineral asset development**
  - **Support quality cost management, and support capital efficiency improvement**
- Further input from the user community is required to develop the MMP-UCCS into an AACE Recommended Practice

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