



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

# Oil Shale Technology Cost Review for Project Planning

**Jimmy Jia <sup>1,2</sup> and Jim Schmidt <sup>3</sup>**

*<sup>1</sup> University of Queensland*

*<sup>2</sup> Uhde Shedden (Australia)*

*<sup>3</sup> PROCOM Consultants Ltd.*

*32<sup>nd</sup> Oil Shale Symposium  
October 15-17, 2012*



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

# Outline



**Background introduction**



**Objectives of cost review**



**Summary of project cost**



**Analysis of factors and stages for project planning;**

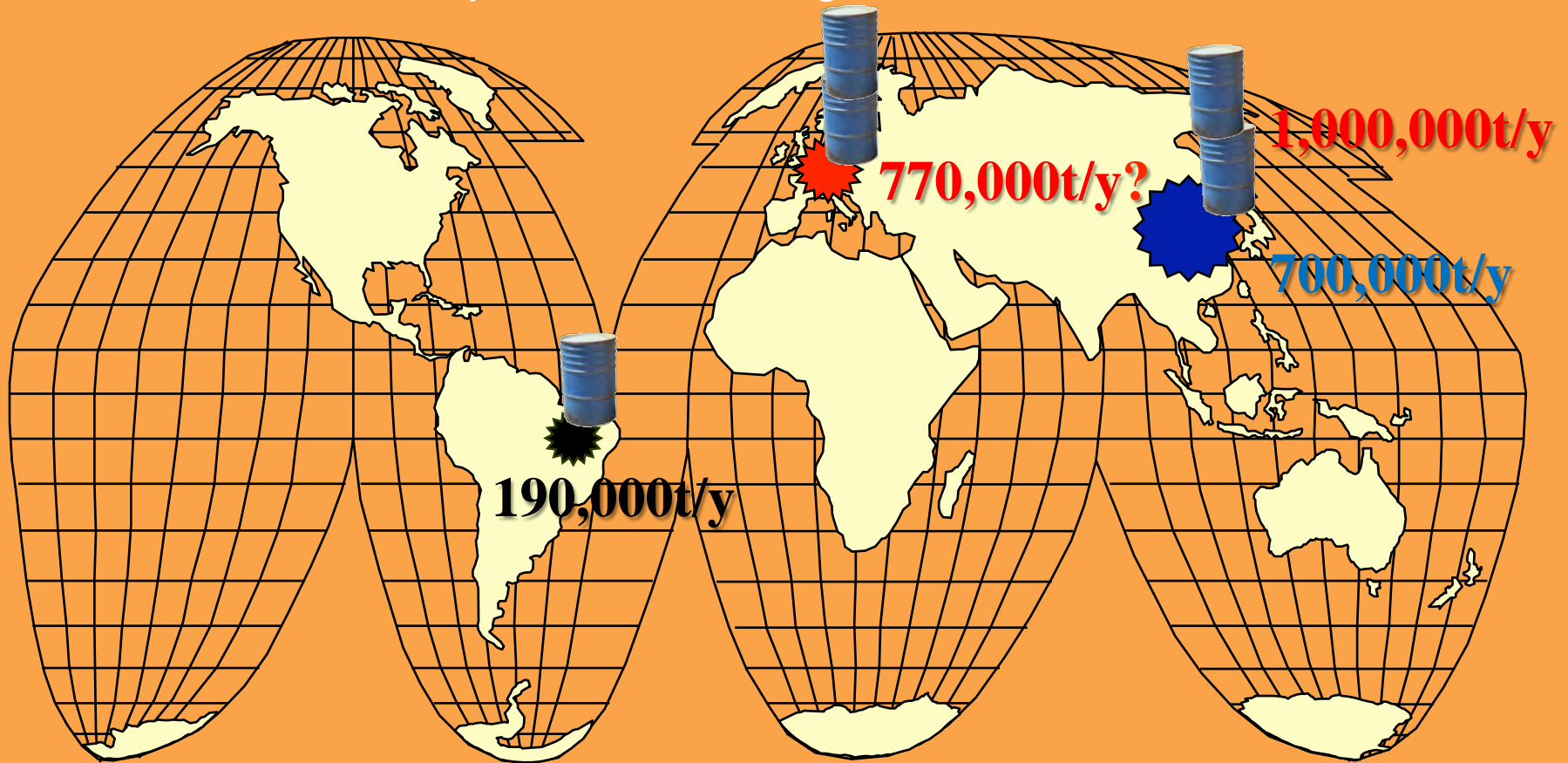


**Conclusion**



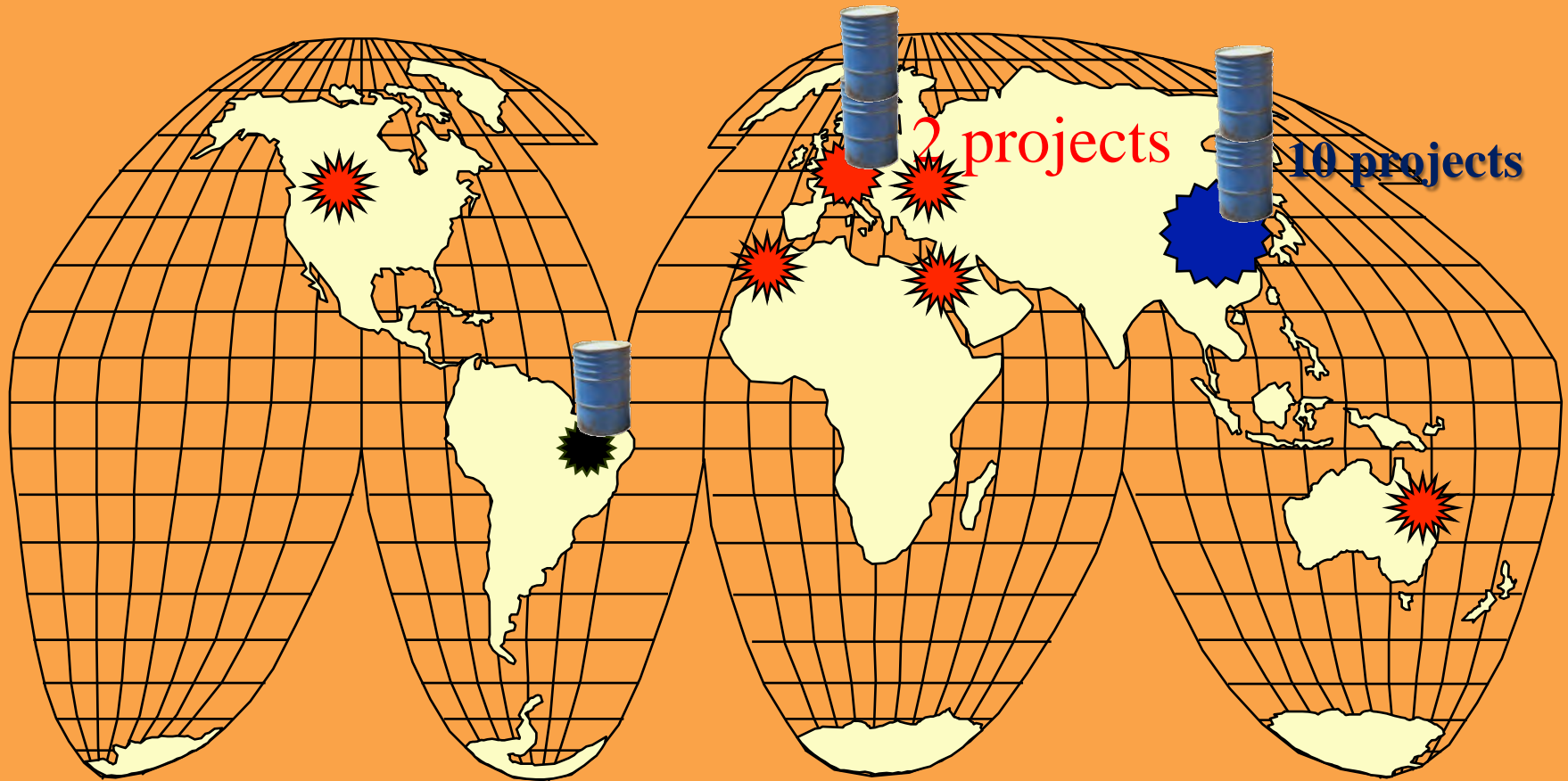
# Shale oil production

- Shale oil production by 2012;





# Shale oil projects





THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

# Objectives of Cost Review

- Prepare for project planning
- Support strategic business planning
- Assessment of initial project viability
- Project location studies
- Evaluation of alternative schemes





# Summary of oil shale projects cost

- Two oil shale projects are completed and in commissioning stage with similar technology in Estonia.

Technology	Galoter	EneFit
Capacity T/D	3000	6720
Year of completion	2010	2012
Cost (M)	\$ 100	€ 182



# Summary of oil shale projects cost

- Two ATP Plants are completed or in commissioning stage

<b>Technology</b>	<b>ATP</b>	<b>ATP</b>
<b>Capacity T/D</b>	<b>6000</b>	<b>6000</b>
<b>Year of completion</b>	<b>1999</b>	<b>2012</b>
<b>Cost (M)</b>	<b>\$180</b>	<b>&lt;\$130</b>
<b>Location</b>	<b>Australia</b>	<b>China</b>



# Summary of oil shale projects cost

- Two oil shale plants are completed in Brazil with vertical kiln retort technology.

<b>Technology</b>	<b>Petrosix</b>	<b>Petrosix</b>
<b>Capacity T/D</b>	<b>6000</b>	<b>1600</b>
<b>Year of completion</b>	<b>1991</b>	<b>1972</b>
<b>Cost (M)</b>	<b>\$93</b>	<b>\$ 35</b>
<b>Location</b>	<b>Brazil</b>	<b>Brazil</b>





# Summary of oil shale projects completed

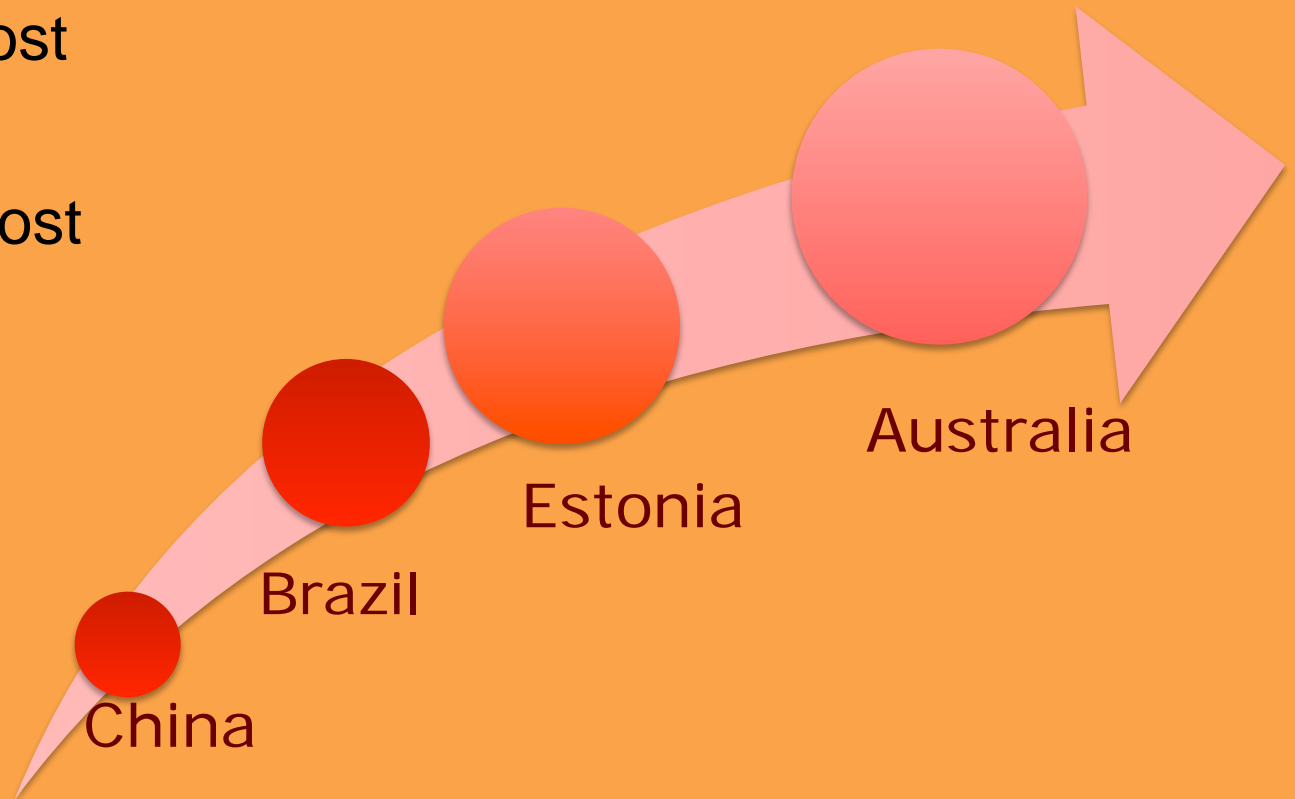
- Typical Chinese oil shale plants are built with multiple vertical kiln retorts which is regarded by some investors as a low cost approach.

Technology	Vertical kiln	Vertical kiln	Vertical kiln	Vertical kiln
Capacity T/D	2000	1000	2000	4000
Year of completion	1991	2009	2010	2010
Cost (M)	10	20	35	40
Location	China LN	China SD	China SD	China GS



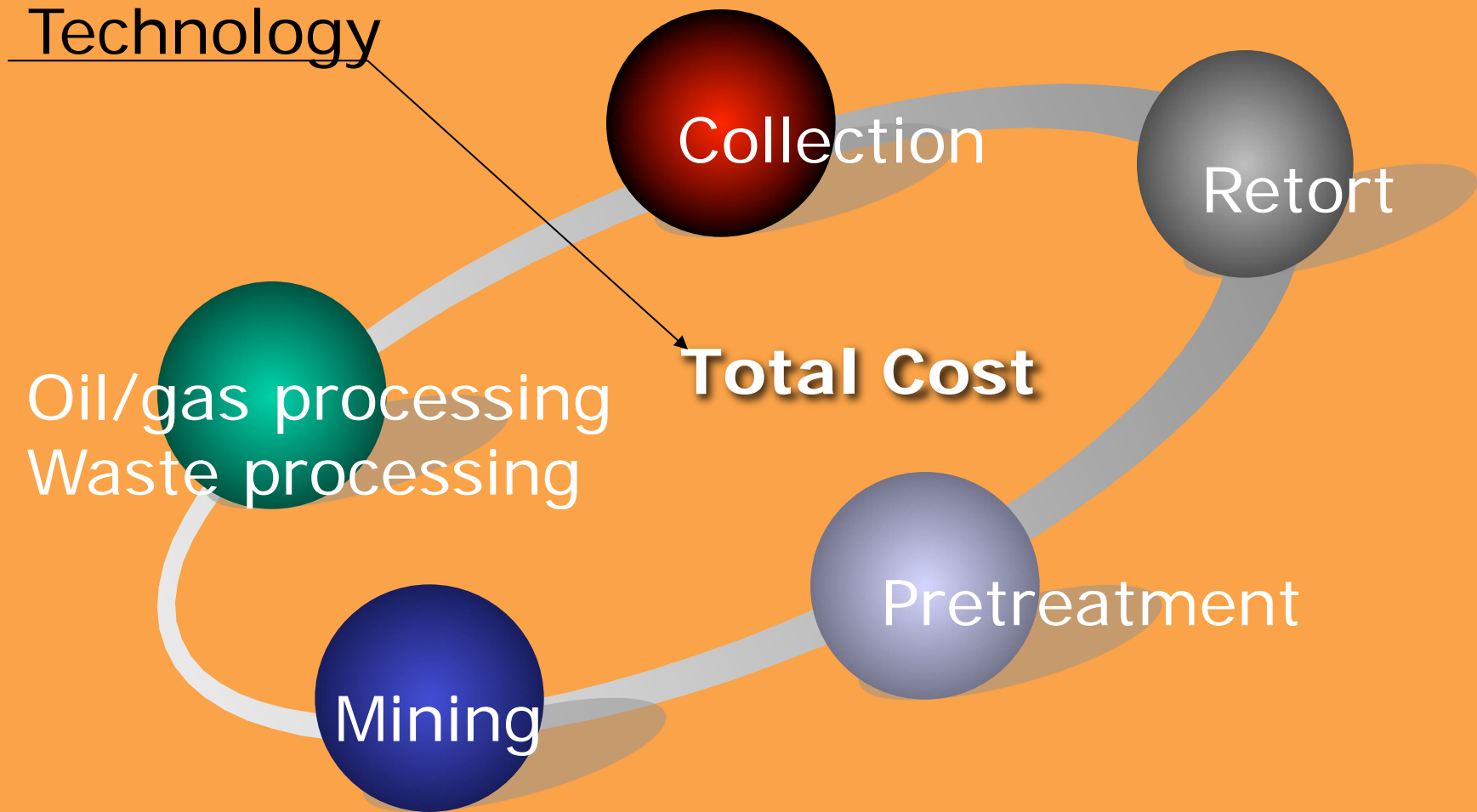
# Cost Versus Location

- Labor cost
- Engineering cost
- Currency
- Manufacture cost
- Transportation
- Environmental
- Tax





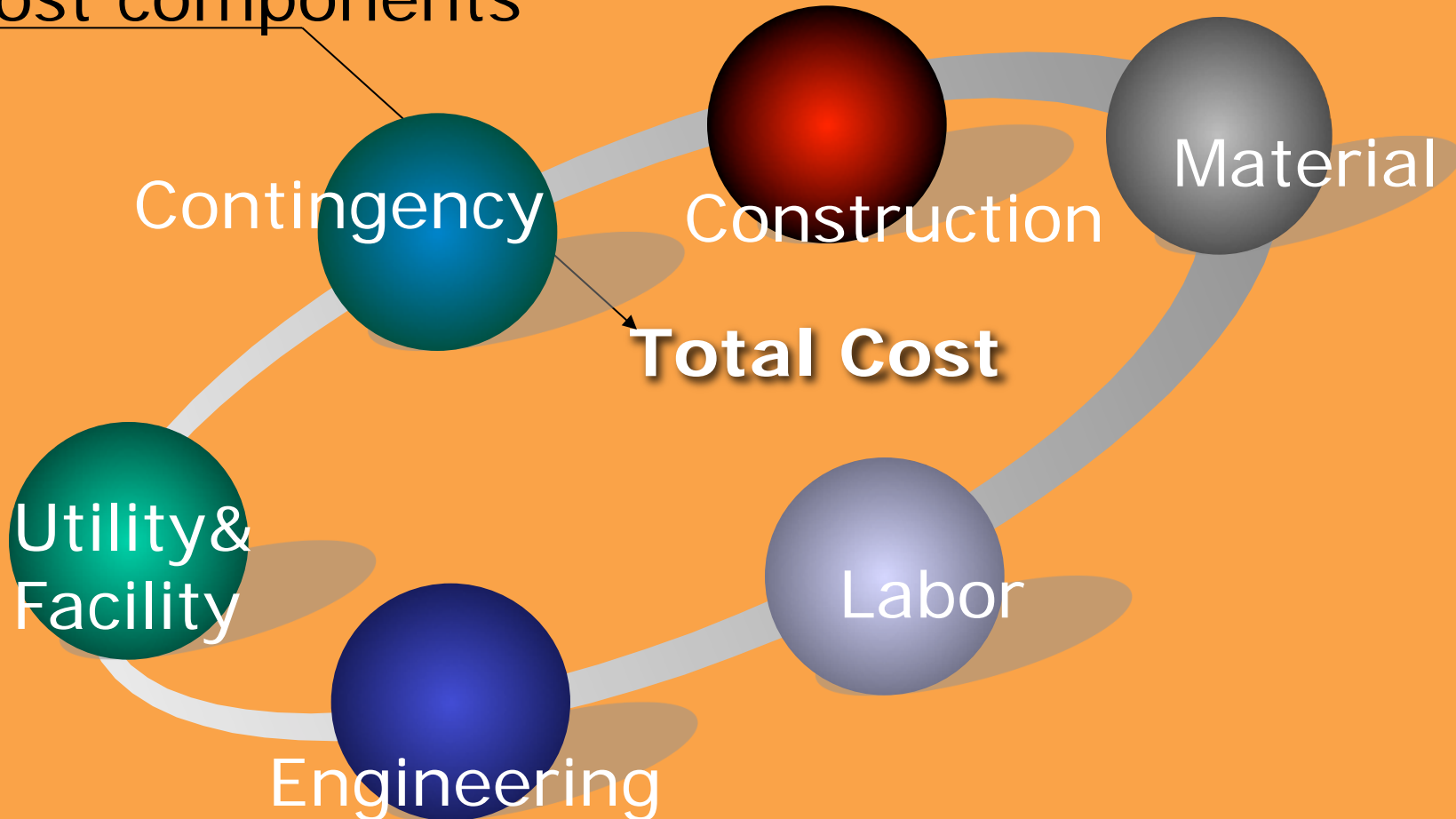
# Cost Factors for CAPEX





# Factors for CAPEX

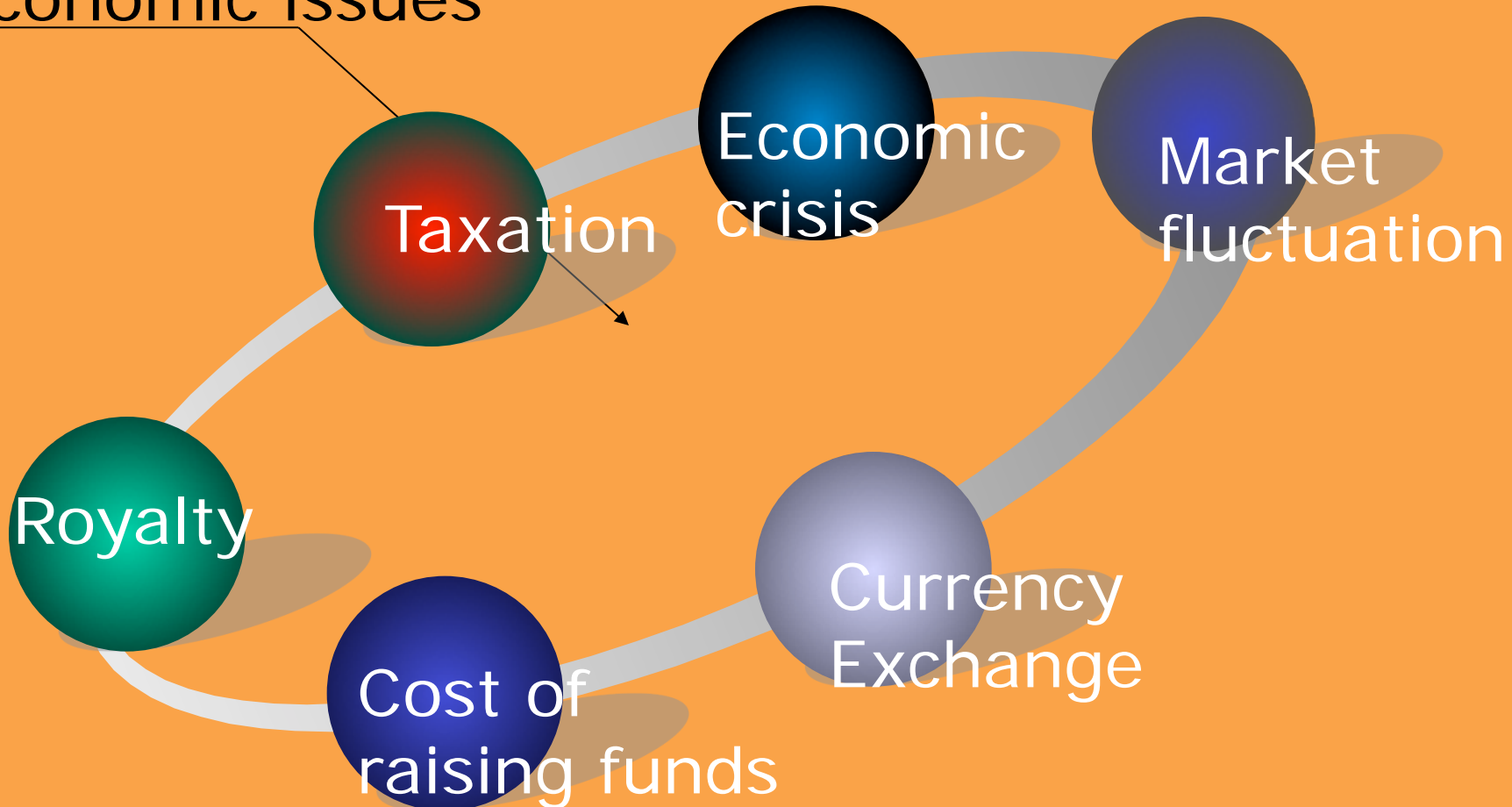
Cost components





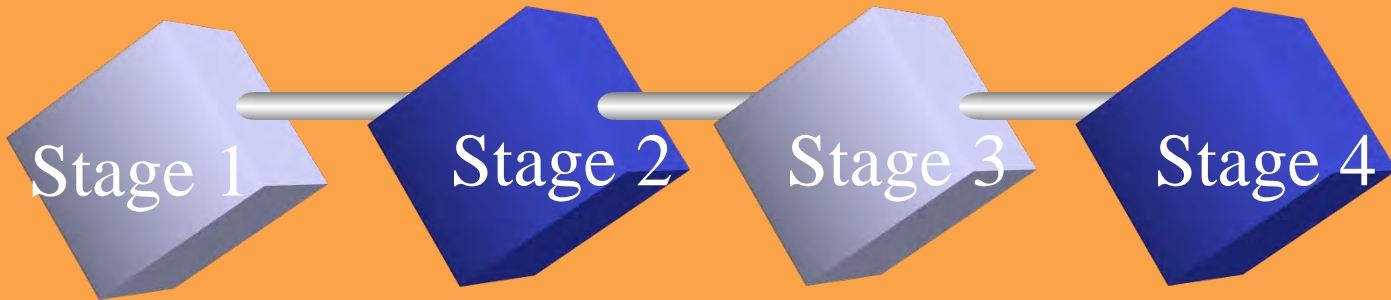
# Cost Factors for Finance

Economic issues





# Project Cost Planning



Concept  
Viability;  
Process  
scheme

FEED  
Technology  
Sizing  
Layout

Detailed  
Engineering  
Long term  
lead items  
accurate

Construction  
& Commiss-  
ioning  
Man power,  
Spare parts;

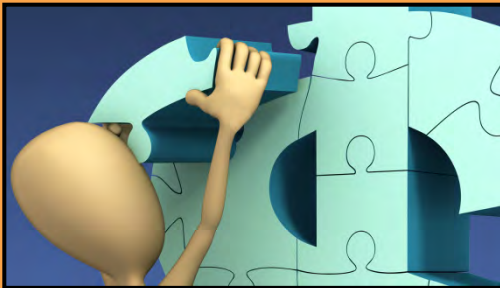


THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

# Engineering Tool for Project Cost Planning



- Shale oil production cost at various economic conditions and different locations

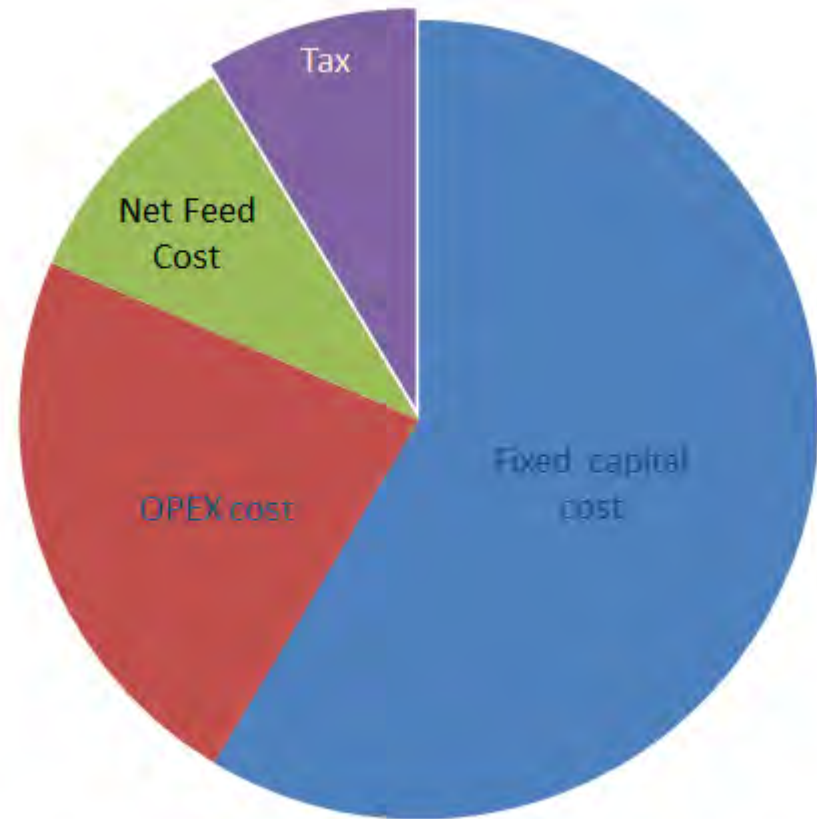


- Budget control with targeted shale oil production cost



# Shale Oil Cost Structure

1. Shale oil production cost can be split into four sections and estimated using engineering tool developed during project planning stages.
2. Project viability and economic outcome can be assessed for various locations and economic conditions.







# Conclusion

- The oil shale production process is unusual compared with conventional chemical processes and not many engineering firms can claim the necessary expertise
- Previous projects provide one of the few reliable reference points for new project planning
- Good project cost plan should identify potential risk during the earliest stages of the project
- A new engineering tool for oil shale project planning could be developed based on real cost of projects.

# Why not having a study – good project plan

