5th IAEE Asian Conference
Meeting Asia’s Energy Challenges

“Peak Coal” in Asia?

February 16th, 2016

Dr. Philip Walsh
Chair– Entrepreneurship & Strategy

TRS 1-066
prwalsh@ryerson.ca
Limitations

• Reliance on primary measures as being accurate

• Assumption of continued trends based on a long-term equilibrium approach

• Demand Side bias to this analysis

• Technological advancement is not fully considered here
Ongoing Debate

• divergent opinions presented in the past year regarding the topic of “peak coal” in Asia.

• recent energy policy in China will mean a reduction of coal consumption in Asia and a peaking of coal production (Pearce, 2014)

• “peak coal” will not occur in the short to medium term (IEA, 2014)
Is this Peak?

Asia Pacific Coal Consumption

Source: BP
“Coal consumption is poised for its biggest decline in history, driven by China’s battle against pollution, economic reforms and its efforts to promote renewable energy.”

Ewa Krukowska, Bloomberg

“These trends show that the so-called global coal boom in the first decade of the 21st century was a mirage,”

Lauri Myllyvirta, Greenpeace’s coal and energy campaigner.
It is not the “Peak”!

“Global demand for coal over the next five years will continue marching higher.... China will be joined by India, ASEAN countries and other countries in Asia as the main engines of growth in coal consumption, offsetting declines in Europe and the United States.”

International Energy Agency

“We have heard many pledges and policies aimed at mitigating climate change, but over the next five years they will mostly fail to arrest the growth in coal demand”

IEA Executive Director Maria van der Hoeven
Will there be a “Peak”?

- World coal consumption “between 2042 and 2062”. Maggio and Cacciola (2012)

- China’s coal peak will occur during “the late 2020s and the early 2030s”. Lin and Liu (2010)

- “the turning point in total coal consumption would occur in 2019” Yu Hao et al (2015)
Asia’s Supply/Demand Dynamic

Coal Net Balance (mtoe)

Source: BP
What drives coal consumption in Asia?

GDP Growth?
- Statistically supported causality established for China, Japan, India and South Korea (Jinke et al. 2008; Bloch et al. 2012; Bildirici and Bakirtas, 2014)

Coal Price?
- Statistically supported causality between higher coal price and lower demand for coal (Burke and Liao, 2015)

Electricity Demand?
- Statistically supported causality between GDP growth and electricity demand (Chang, 2010; Abbas and Choudhury, 2013)
Relationship of Coal Price to Demand

Asian Coal Consumption vs Australian Coal Price

Source: World Bank, BP
Relationship of GDP to Coal Demand

Asian GDP vs Asian Coal Consumption

Source: World Bank, IMF, BP

R² = 0.9731
Relationship of GDP to Electricity Demand

Asian GDP vs Asian Electricity Generation

Source: World Bank, IMF, BP

R² = 0.996
### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.807</td>
<td>.650</td>
<td>.625</td>
<td>430.571</td>
</tr>
</tbody>
</table>

The independent variable is CoalPrice.

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.986(^a)</td>
<td>.973</td>
<td>.972</td>
<td>117.31442</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), AsianGDP

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.993(^a)</td>
<td>.986</td>
<td>.985</td>
<td>84.82647</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), AsianElectric
## Results of Hierarchical Regression

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.776&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.602</td>
<td>.588</td>
<td>451.21808</td>
</tr>
<tr>
<td>2</td>
<td>.992&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.985</td>
<td>.984</td>
<td>90.01826</td>
</tr>
<tr>
<td>3</td>
<td>.996&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.993</td>
<td>.992</td>
<td>63.11277</td>
</tr>
</tbody>
</table>

- a. Predictors: (Constant), CoalPrice
- b. Predictors: (Constant), CoalPrice, AsianGDP
- c. Predictors: (Constant), CoalPrice, AsianGDP, AsianElectric
Coal Consumption Forecast Model – Disaggregated Input

Korea: Electricity Generation (Twh) from Coal

Vietnam: Electricity Generation (Twh) from Coal

Taiwan: Electricity Generation (Twh) from Coal

Thailand: Electricity Generation (Twh) from Coal

Source: BP
Coal Consumption Forecast Model – Disaggregated Input

India: Electricity Generation (Twh) from Coal

Source: BP
Coal Consumption Forecast Model

Forecast Asian Coal Consumption

- Historical Coal Consumption
- Low Case - Electricity Generation Dominant Model
- High Case - GDP Dominant Model
- Likely Case - Hybrid Model
Long term price equilibrium

Australian Coal Price
(US Real $/tonne)

Source: World Bank
Results

• First, Australia and Indonesia have exploited the declining production of indigenous coal in consuming countries with substantial growth in production exports.

• Second, GDP growth is significantly correlated with growth in coal consumption with the price of imported coal having a lesser significance in correlation. GDP drives electricity demand which can lead to increased coal use in the absence of clean technology policies.

• Third, current import prices in real terms for coal are below the long-term price equilibrium and with lower production costs suggests continued economic value for consuming coal.

• Fourth, “peak coal” is less likely to occur in the near to mid term supporting forecasts by detractors of the “peak coal” prediction.
Conclusions

• While economic growth in Asian countries is forecasted to decline slightly over the near to mid term, the overwhelming reliance on coal by emerging Asian countries will continue to result in the growth in consumption of coal. Current energy policies that seek to limit carbon emissions or to protect domestic industries are not significant enough to limit this growth. The prediction of “peak coal” in the near term is unlikely to take place and only more aggressive policies to limit carbon emissions at the expense of higher energy costs will result in reduced coal consumption and related coal production in the Asia-Pacific region.


References (continued)


