

# **Energy Security Modelling: Case of Indonesia**

International Conference on Calculator 2050

Grand Hyatt Hotel, Taipei

February 2015

# Agenda

- Background
- Energy security indicators
- Challenges



# Background

# Indonesian Energy Sector

- Demand-side:
  - Fastest demand growth among ASEAN countries
  - Demand drivers: households and industries
  - Subsidized energy pricing on oil fuels and electricity
  - Electrification ratio:  $\pm 80\%$  → but some islands still below 50%
- Supply-side:
  - [Limited availability of depletable fossil energy resources](#)
  - Former OPEC member → Net oil importer country
  - Large deposit of coal (mostly lignite) and natural gas resources
  - Exporting of natural gas, coal and crude oil
  - [Untapped abundant renewable energy resources](#)



# Energy Security

# Modelling Energy Security

- Diversity index on primary energy sources: Shannon-Weiner Index (SW)

$$SW = -\sum_i x_i \ln x_i$$

where  $x_i$  is share of energy source  $i$

- Import dependency (ID):

$$ID = \frac{IMP}{SUPPLY} \text{ or } \frac{IMP}{DEMAND}$$

where  $IMP$  is the total quantity import,  $SUPPLY$  is the total energy supply and  $DEMAND$  is total energy demand.

- Total supply = (Domestic production - export)  $\forall$  fuel  $i$
- Total demand = (Domestic consumption + export)  $\forall$  fuel  $i$  or



# Challenges

# Challenges

- Measuring energy security: quantities vs. values of imported
- Cost data availability
- Different perspectives on energy security





# Thank you

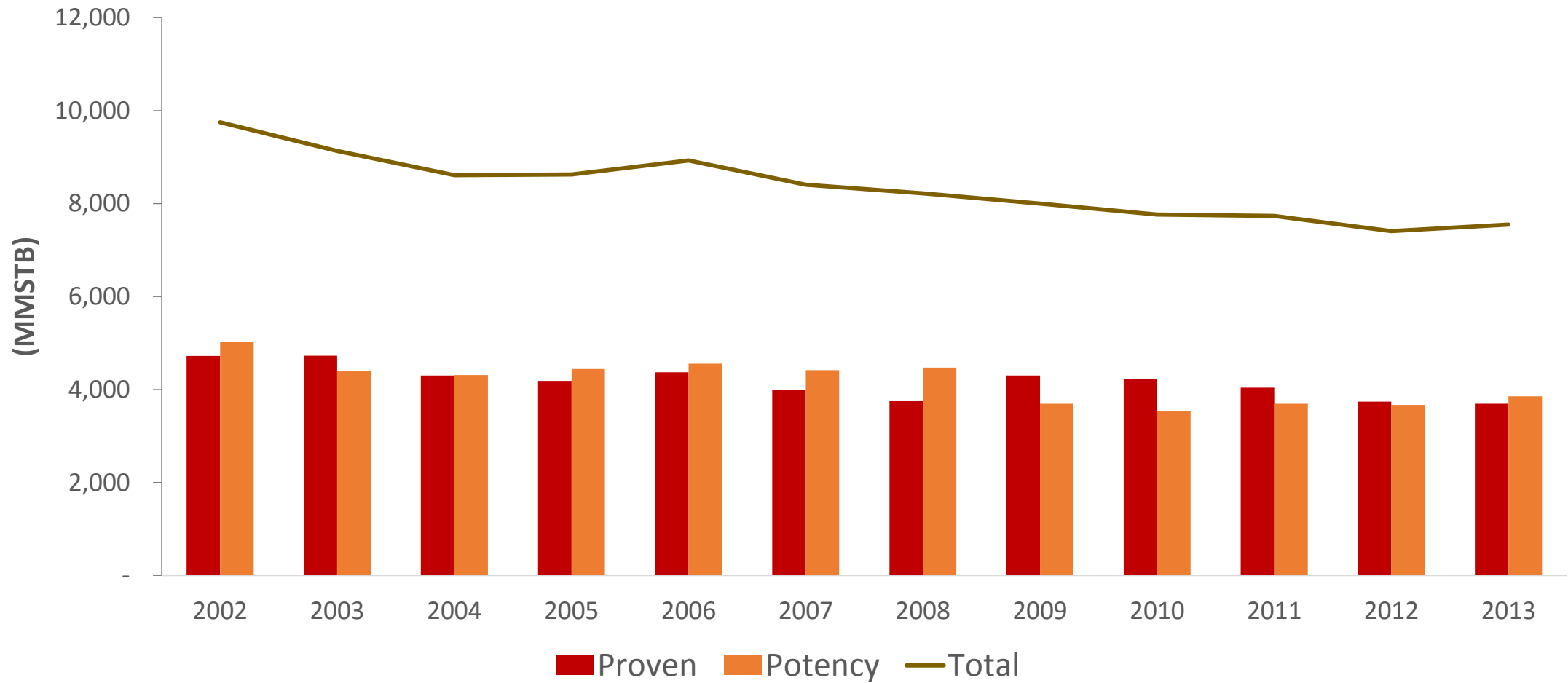
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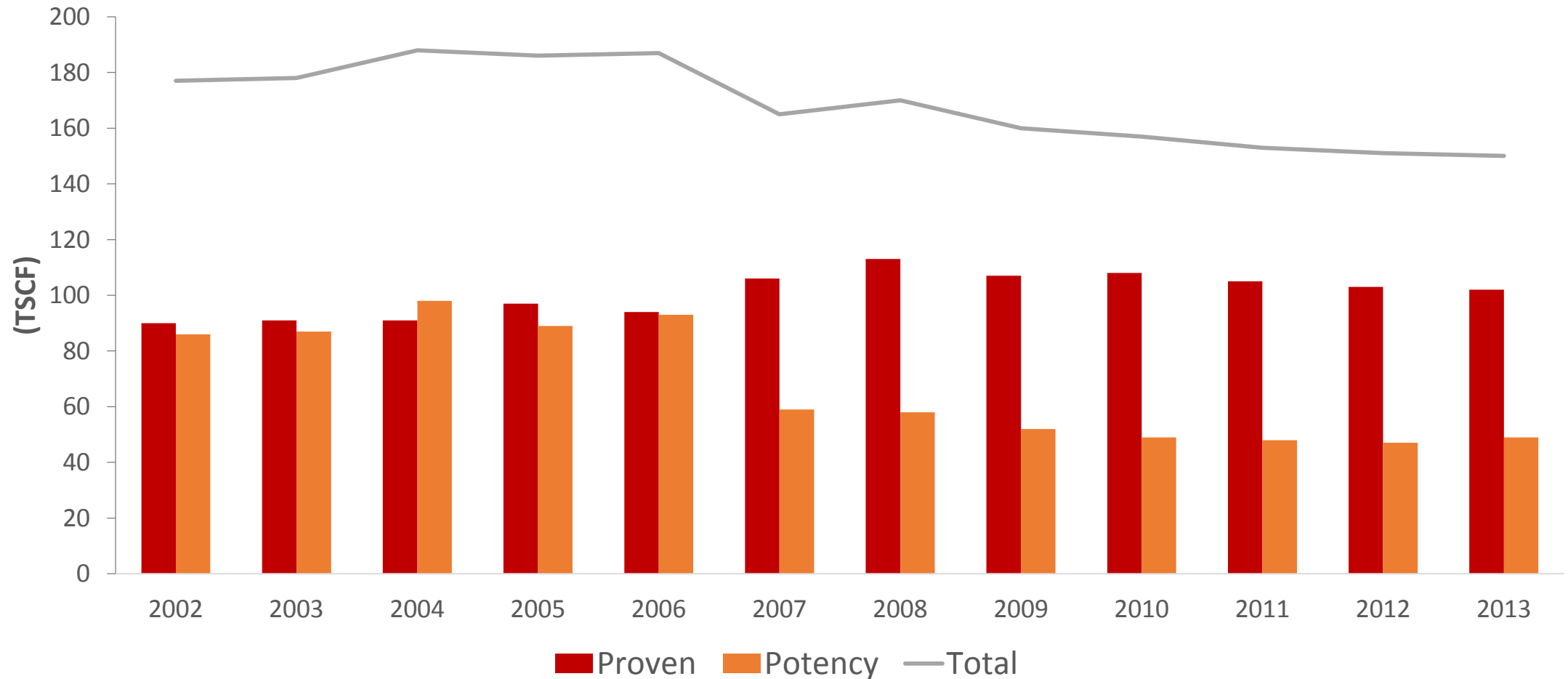
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# Appendices

# Crude oil reserves



# Natural gas reserves



# Geothermal Potential

Island	No. of Location	Energy Potency (MWe)					Total	Installed capacity
		Resources			Reserve			
		Speculative	Hypothetic	Possible	Probable	Proven		
Sumatera	93	3,183	2,469	6,790	15	380	12,837	122
Jawa	71	1,672	1,826	3,786	658	1,815	9,717	1,134
Bali-Nusa Tenggara	33	427	417	1,013	0	15	1,852	5
Kalimantan	12	145	0	0	0	0	145	
Sulawesi	70	1,330	221	1,374	150	78	3,114	80
Maluku	30	545	96	450	0	0	1,071	
Papua	3	75	0	0	0	0	75	
<b>Total</b>	<b>312</b>	<b>7,454</b>	<b>4,931</b>	<b>13,315</b>	<b>823</b>	<b>2,288</b>	<b>28,811</b>	<b>1,341</b>
		12,385		16,426				
<b>Total Resources + Reserves</b>		<b>28,811</b>						