Operational challenges related to VRE, based on Chinese experiences

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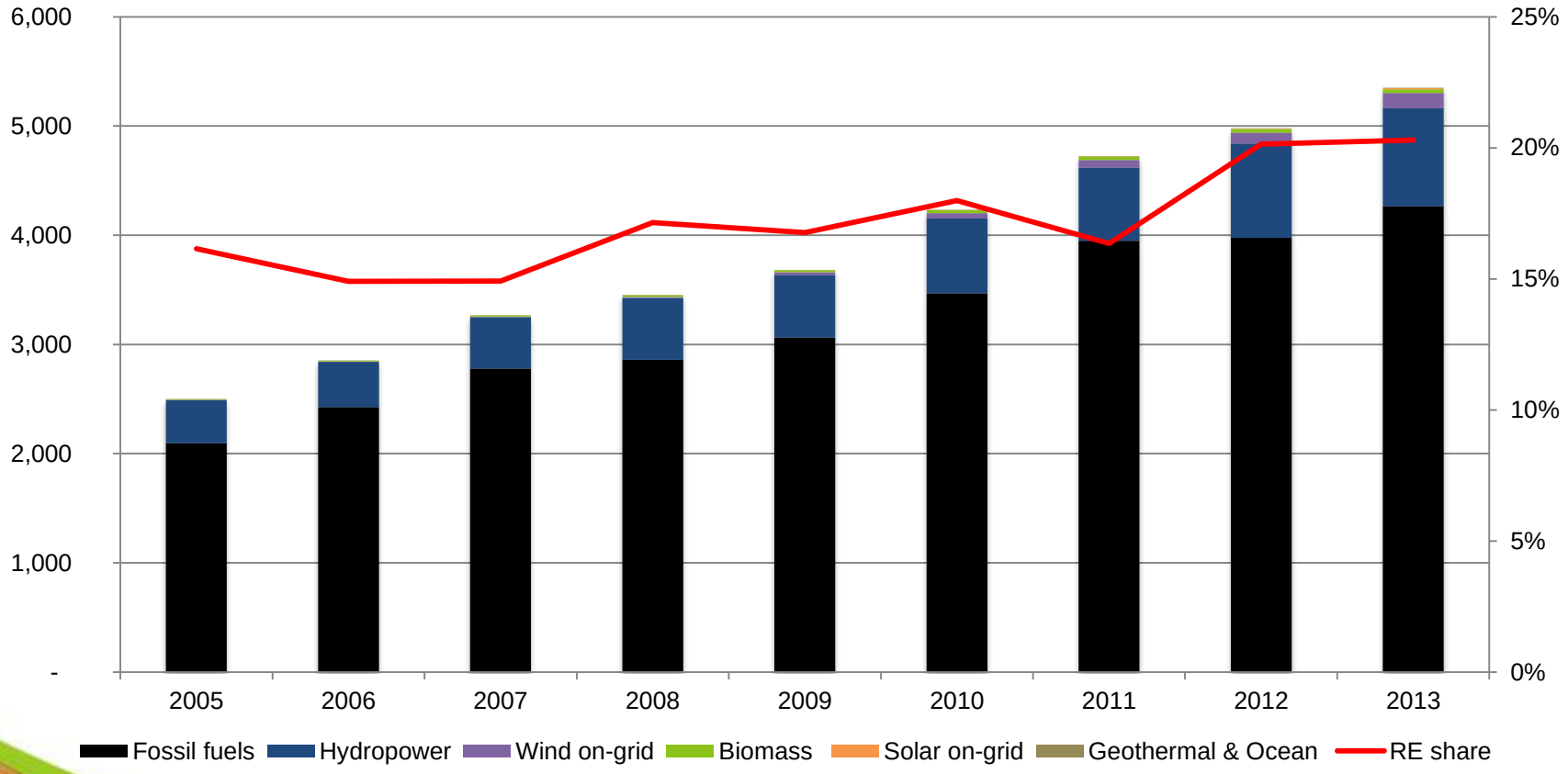
China Power production



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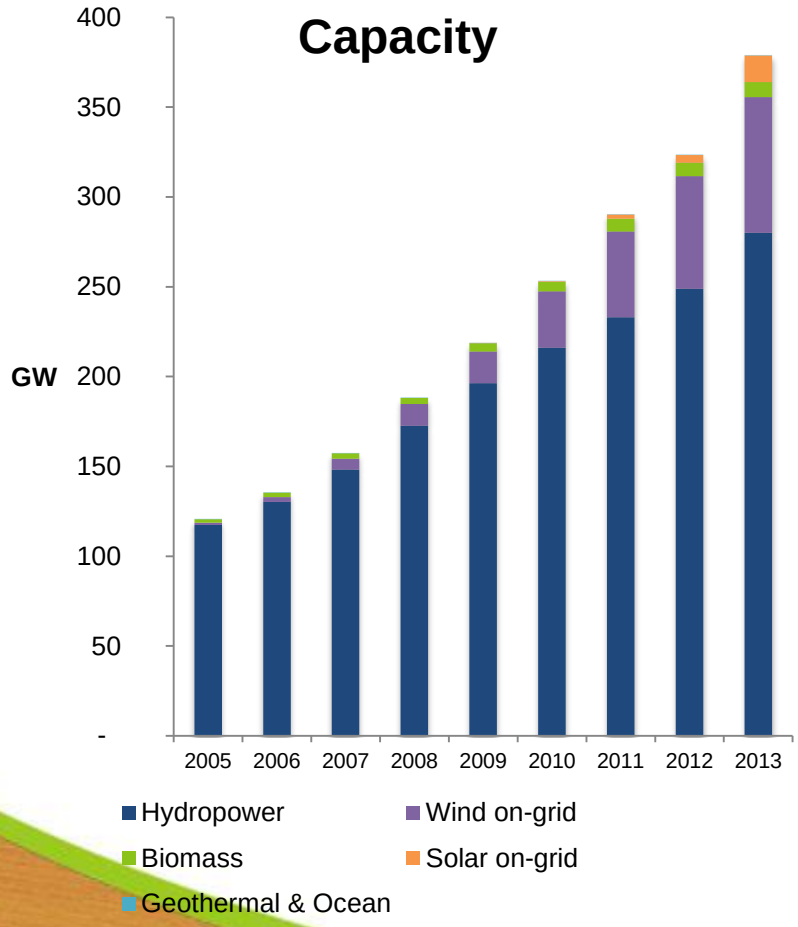
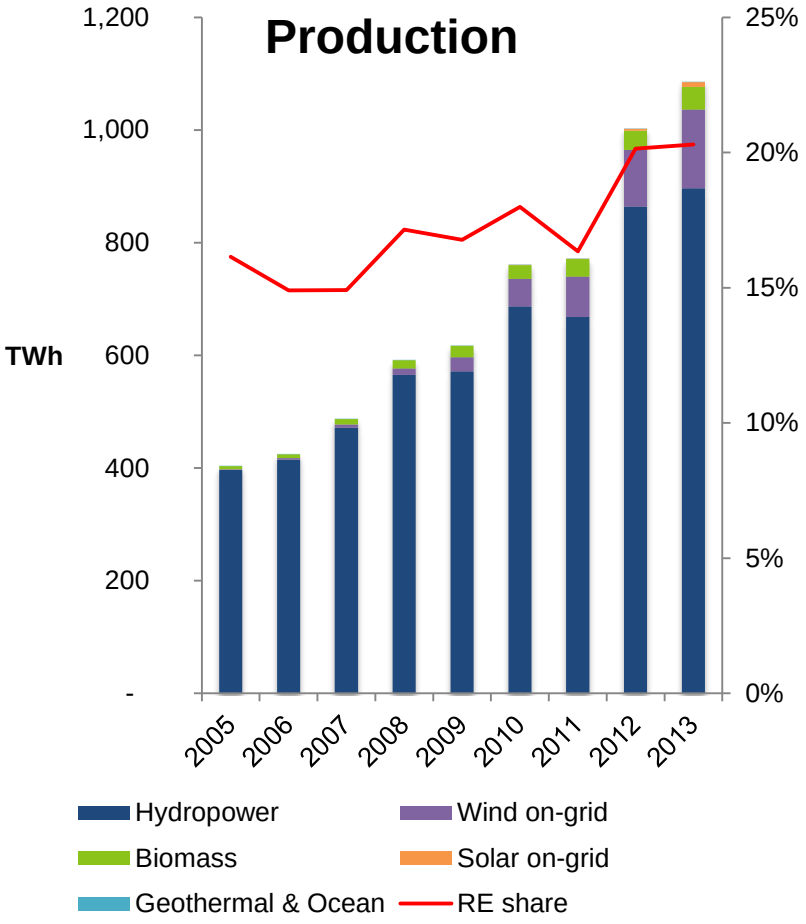
RE Power development





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Stepwise discovery of challenges and needs

- Step 1: Before 2007
  - No considerations
- Step 2: 2007 - 2012
  - Technical characteristics – grid stability, dynamic response, etc.
- Step 3: 2010 -
  - Balancing the system: Dispatch considerations – from add-on to integrated part of the power system
- Step 4: 2012 -
  - System wide economic optimization – including generation and grid
  - Considerations regarding security of supply (capacity value of VRE etc.)
  - Modelling the impact of different policy measures for promoting RE

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CREAM-EDO

- Bottom-up model on province level
- Least cost optimisation model on an hourly basis (mixed integer – LP model)
- Including generation, storage, transmission capacity (bottlenecks) and load
- Capable of investment decisions, dispatch including unit commitment and reserves (to some extent)
- Currently sufficient for policy making

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