Renewable energy auctions in Sub-Saharan Africa

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GSB
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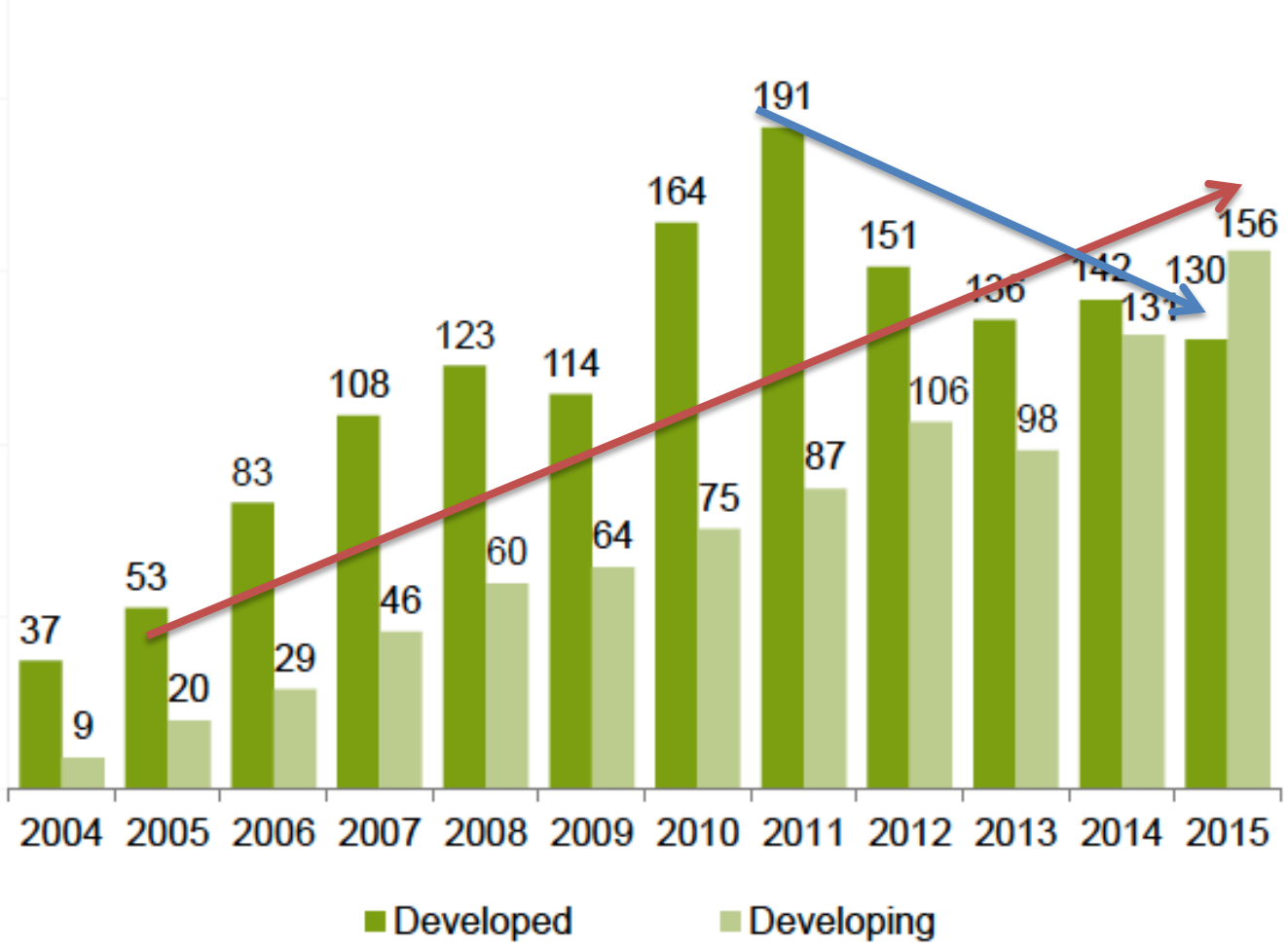
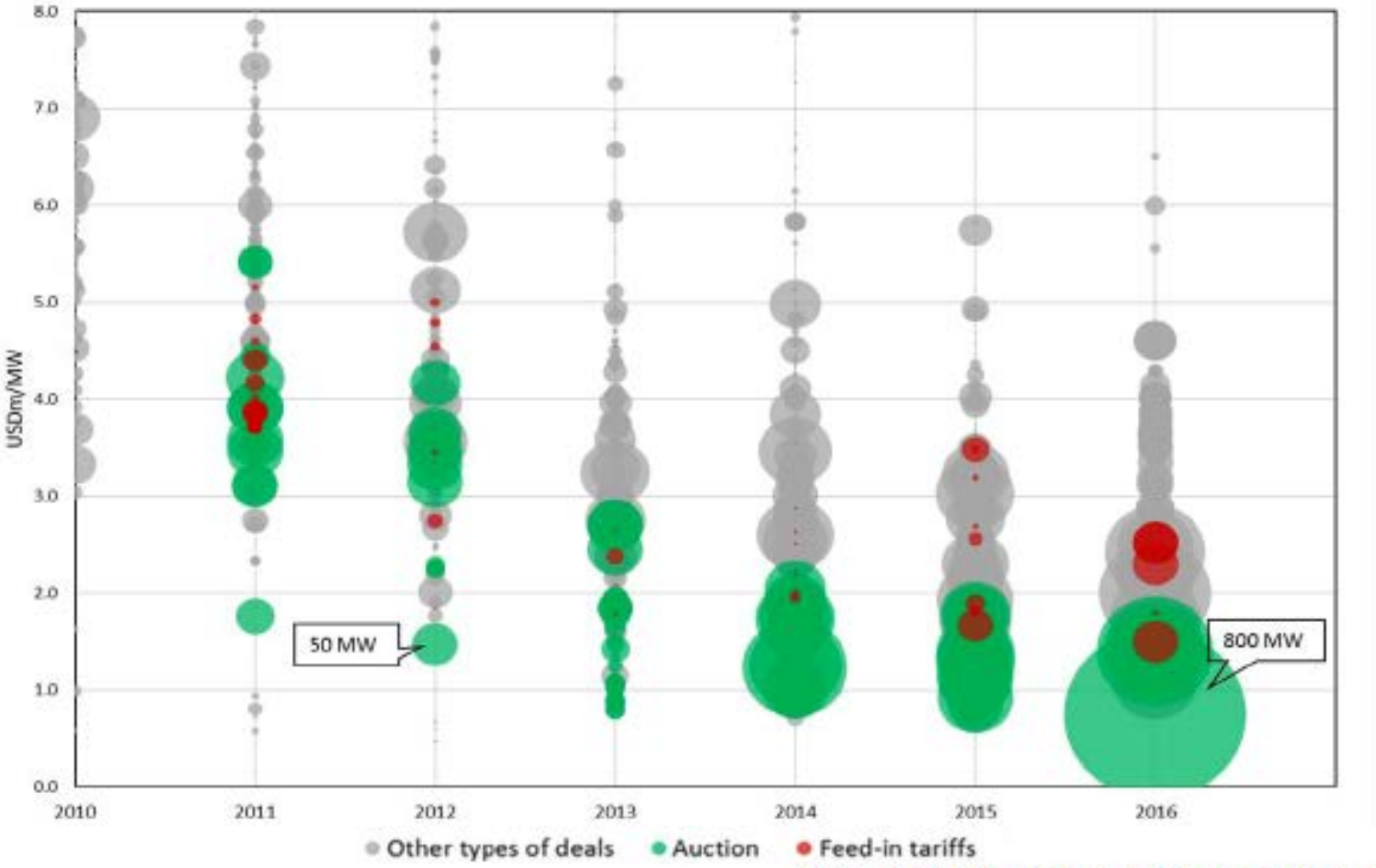
We are on the cusp of a disruptive
and transformative shift
in the (African) power sector.

Shift in RE investment to developing countries



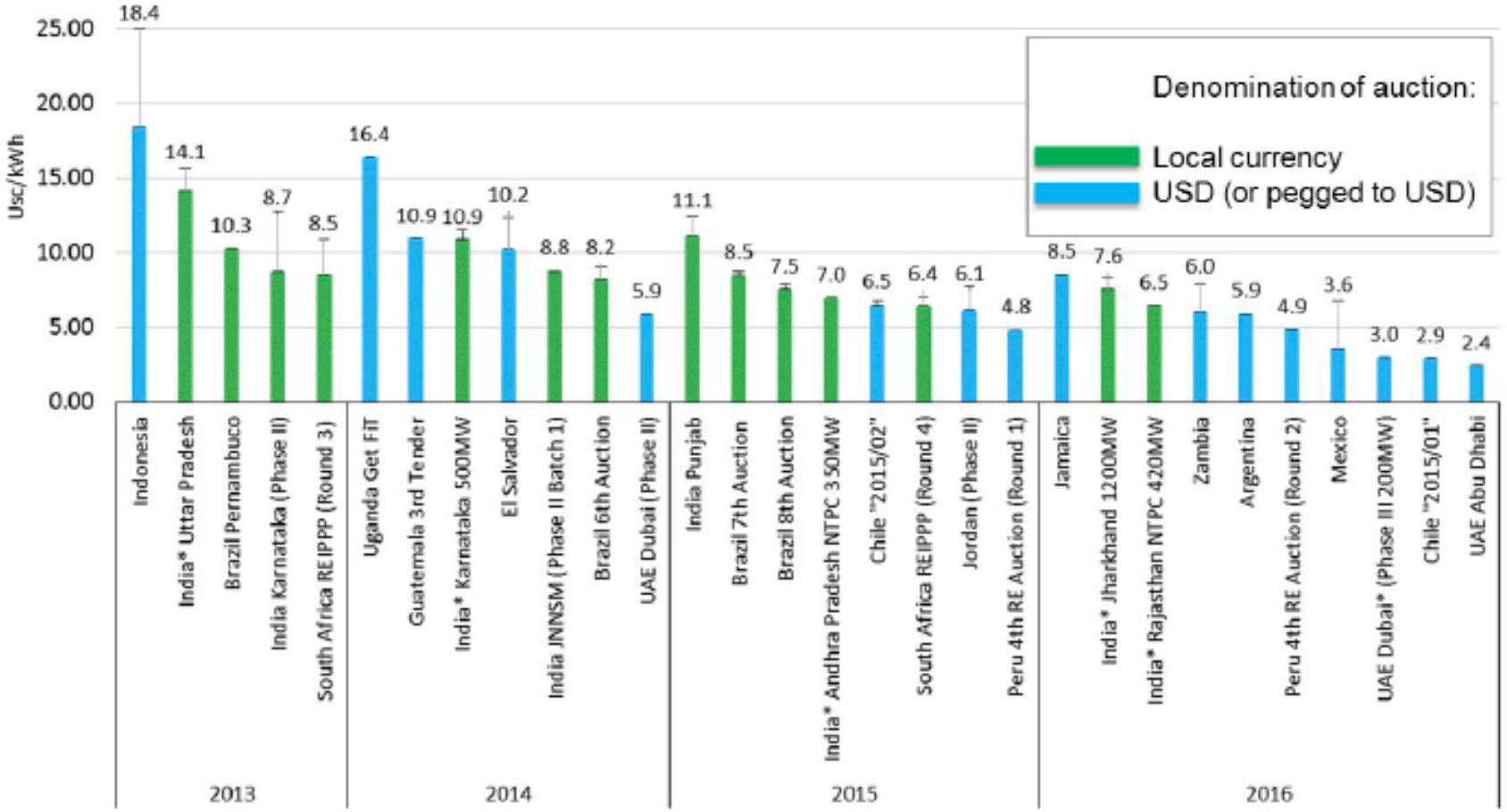
Source: BNEF/UNEP (2016)

Lowest renewable energy prices achieved through auctions



Source: World Bank based on IHS and BNEF databases

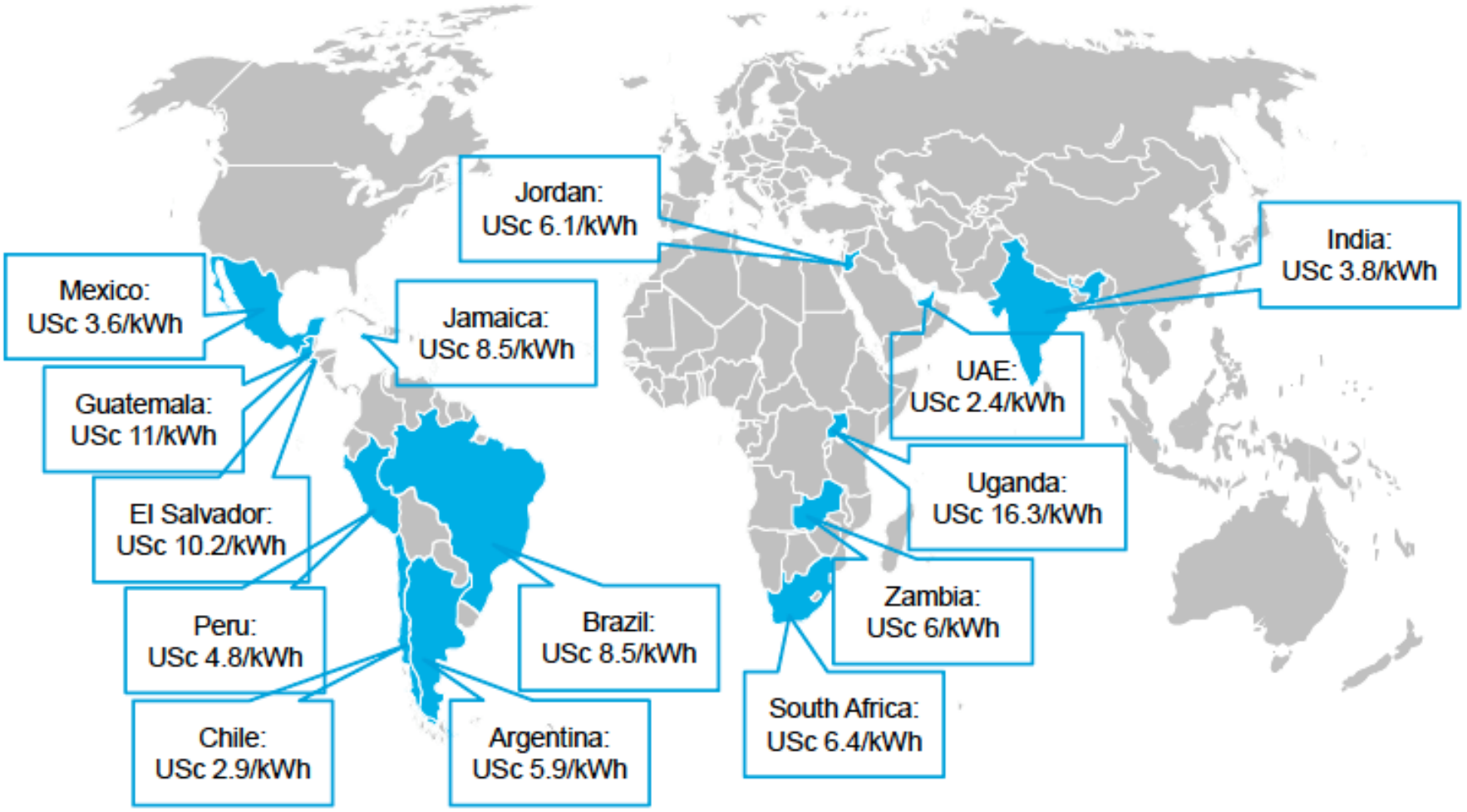
Results of major RE auctions in developing countries (2014-16)



Note: The lowest winning bid in each auction is shown. Bars above the lowest winning bid represent ranges of all winning bids in every auction in cases when there were several winners. Prices in Argentina, Brazil, Chile, Jamaica, Mexico, Peru and South Africa are indexed. *For India only the auctions with the highest and the lowest winning bid per year are shown (due to too many auctions being organized in India).

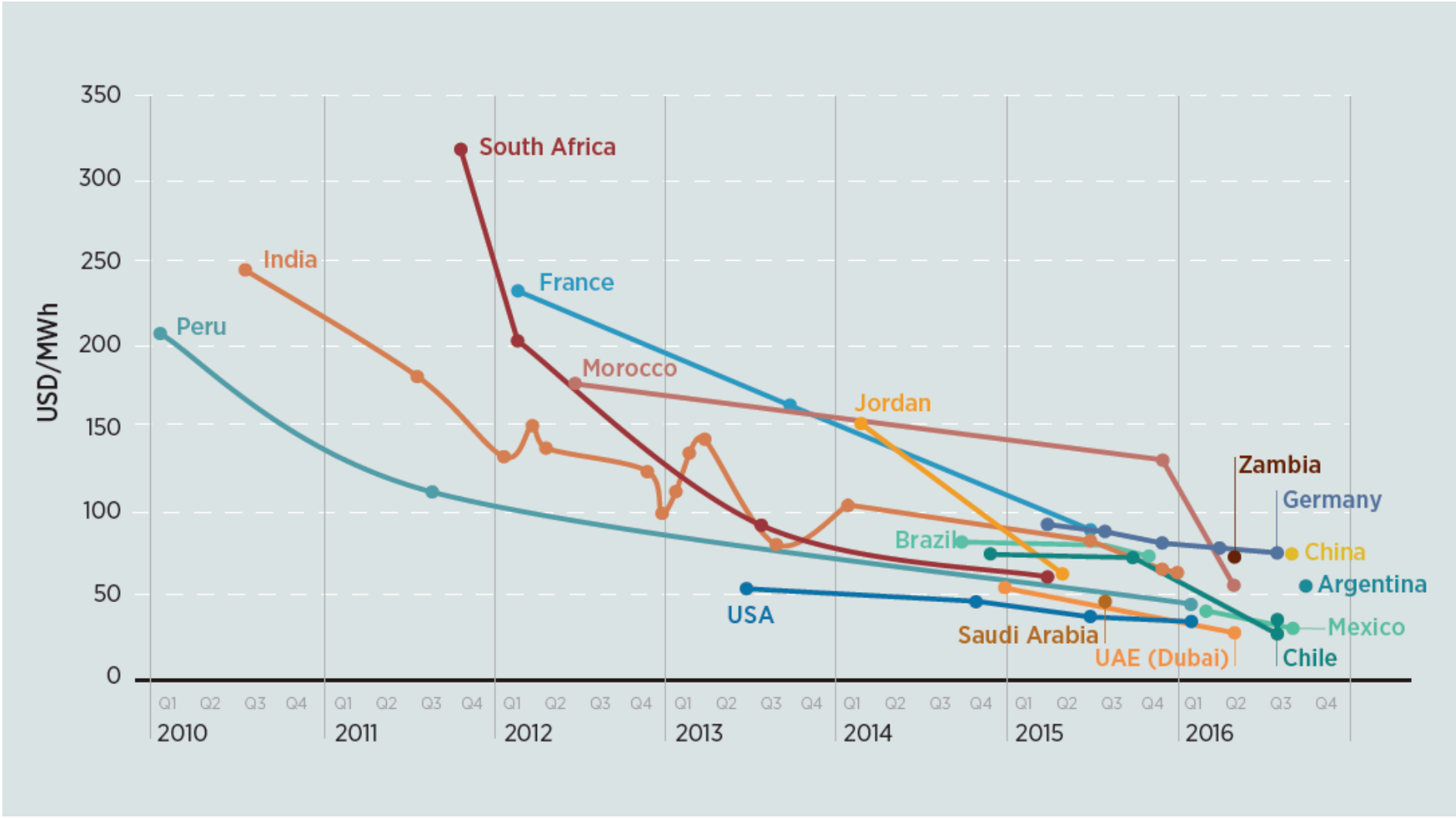
Source: World Bank

Solar PV auction results in developing countries



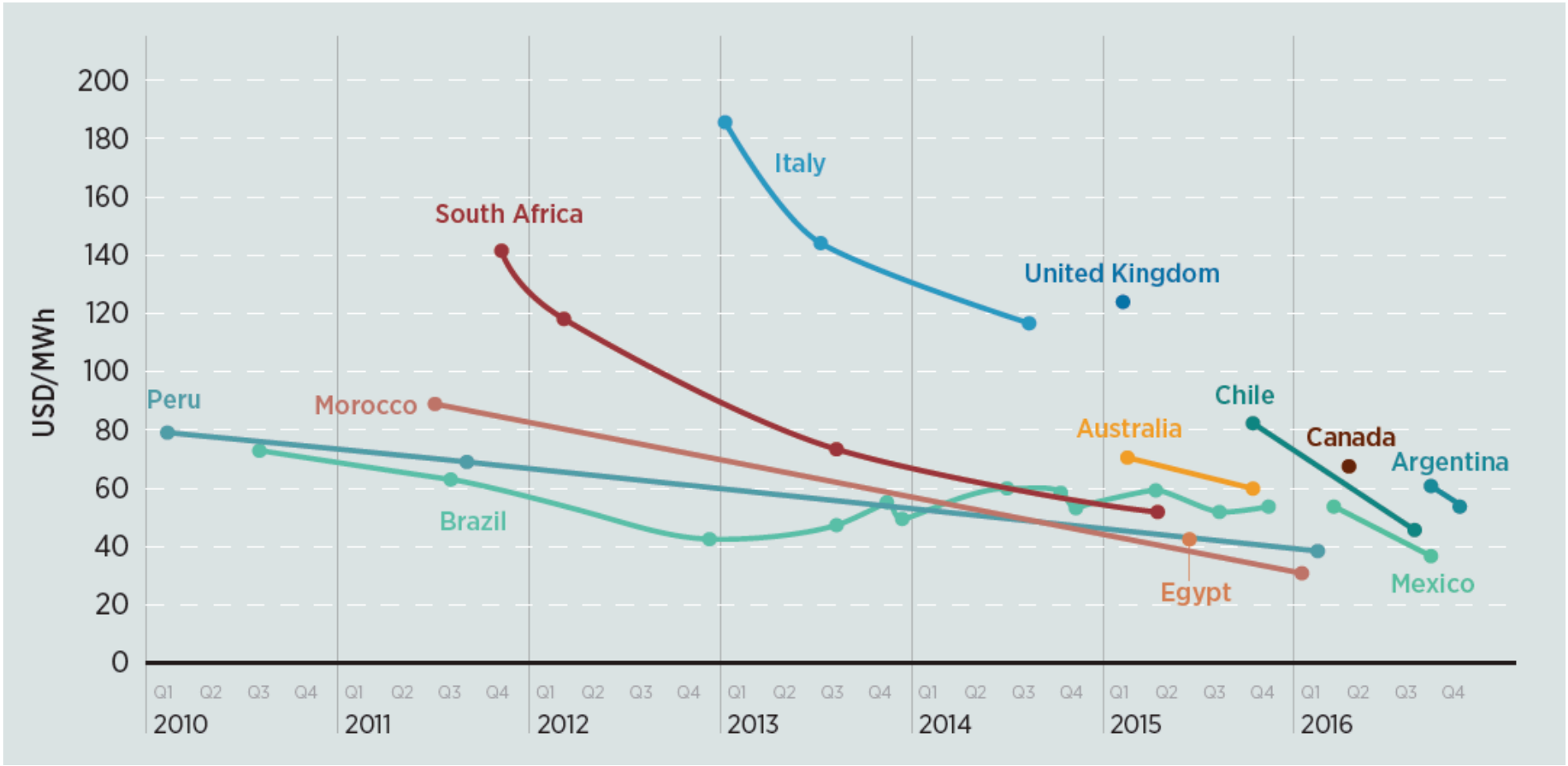
Source: World Bank

Solar PV auction results: 2010 - 2016



Source: IRENA (2017)

Onshore wind auction results: 2010 - 2016



Source: IRENA (2017)

RENEWABLE ENERGY AUCTIONS IN SUB-SAHARAN AFRICA

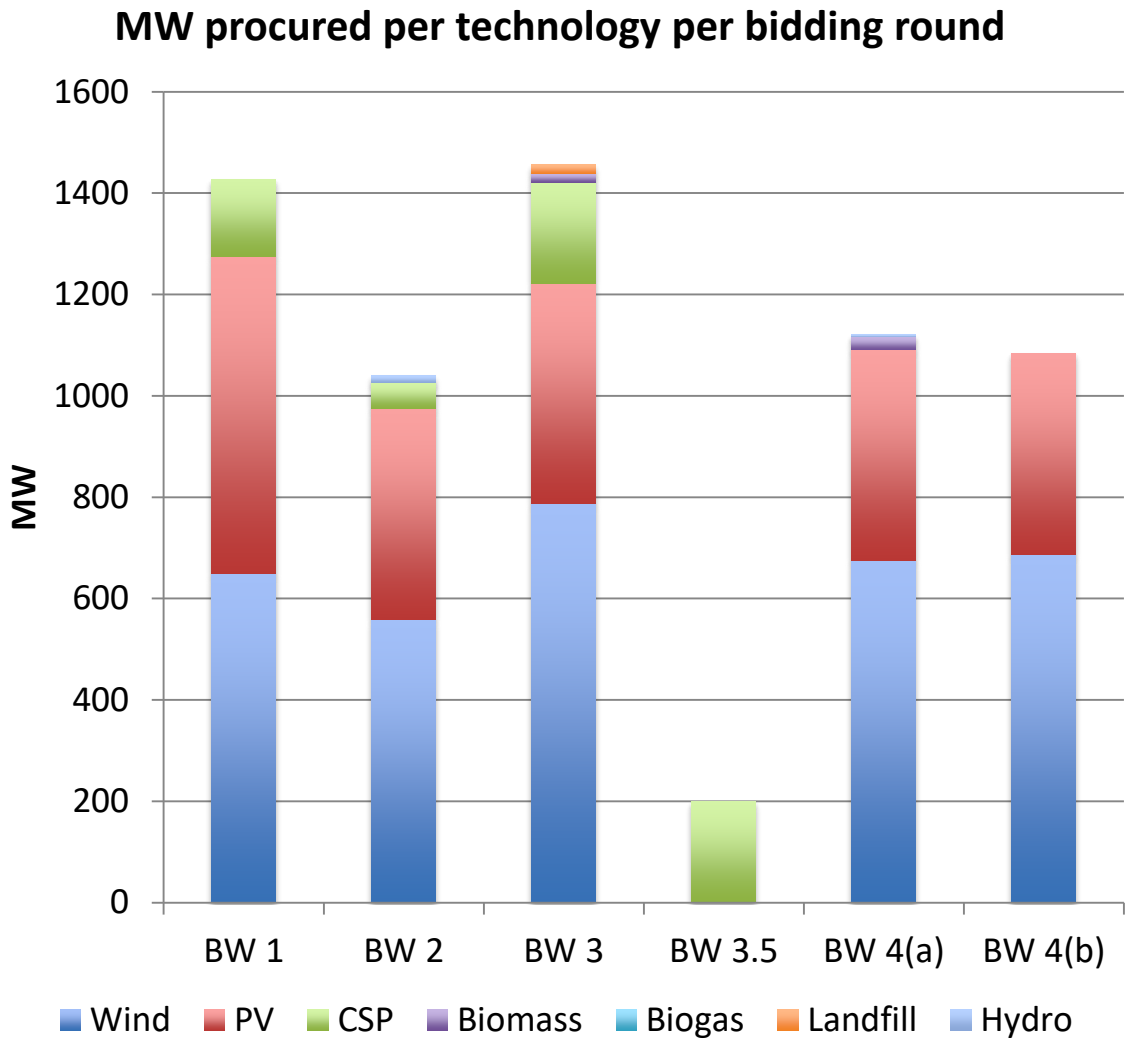
Recent RE Auctions in Sub-Saharan Africa

	Uganda	Zambia	Ghana	Namibia	Malawi	Ethiopia
Year	2014	2016	2016	2017	2017	2017
Auction Demand	4 x 5MW Solar PV	2 x 50MW Solar PV	1 x 20MW Solar PV	1 x 37 MW Solar PV	Max 80 MW Solar PV (4x sites)	1 x 100 MW Solar PV
Site Selection	Developer (3km - grid)	Selected by govt.	Developer (multiple)	Selected by govt.	Substations identified by govt.	Selected by govt.
Local Content	None	None	20%	None (but 30% local shareholding)	5% devt & construction. 20% O&M	15%
Evaluation	70:30 Price: Technical	Price	Not clear	70: 30 Price: Technical	Price	70:30 Price: Technical
PPA	20 Years	25 Years	20 Years	20 Years	25 Years	20 Years
Guarantees	Sovereign & Liquidity	Sovereign & Liquidity	Sovereign & Liquidity	None	Sovereign & Liquidity	Sovereign (?)
Winning Price (US$c/kWh)	16,37	**6,02**	11,47	**6,02**	7,35 – 10,35 (TBC)	Below 6 (TBC)
Currency	US$	US$	US$	NA$	US$	US$

Expressions of Interest for 100MW PV Project in Botswana

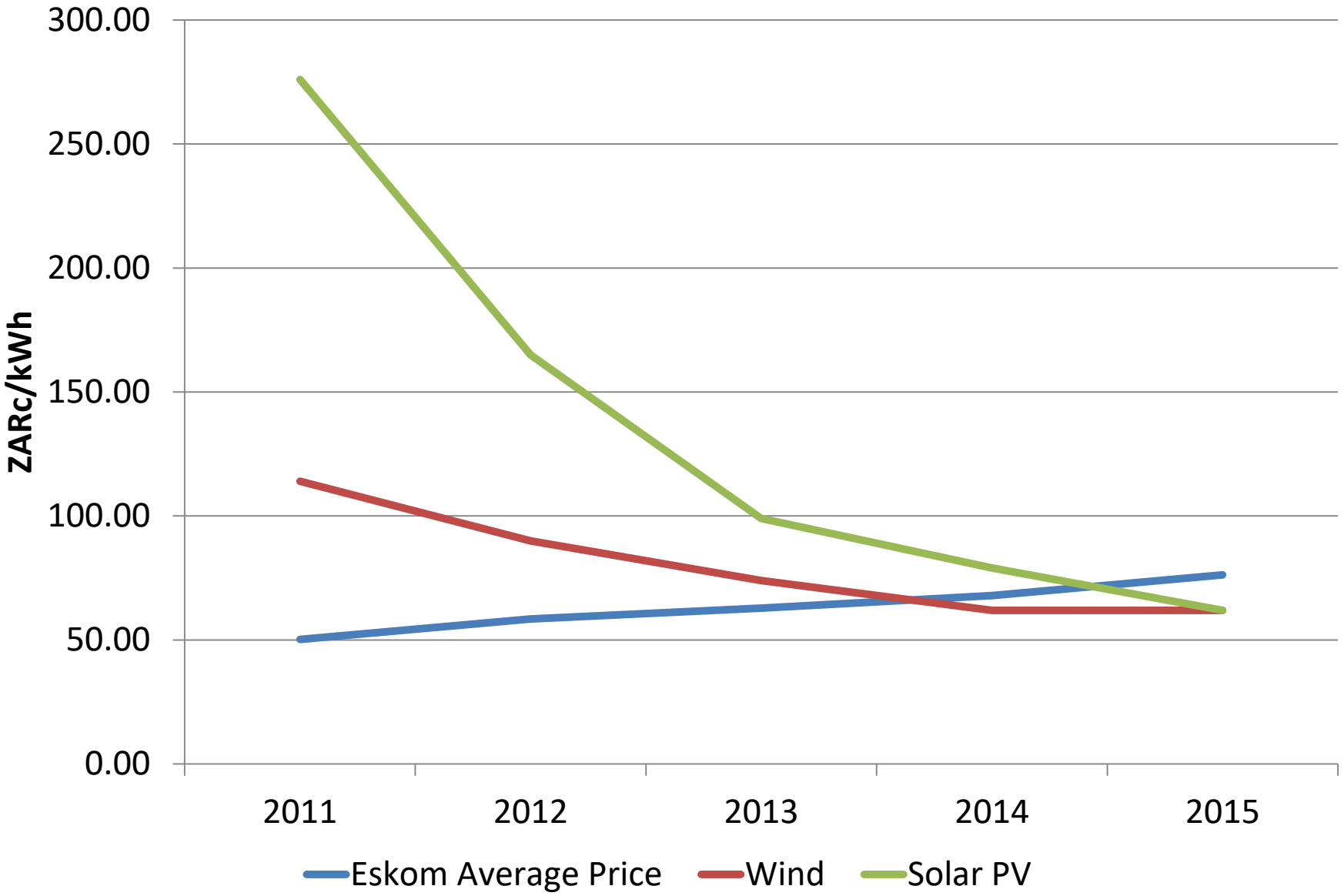
1. Africa Clean Energy Solutions
2. China Construction Power and Environment Engineering Co Ltd
3. Aveng Manufacturing
4. Changhong Research Labs Inc.
5. CMI Energy
6. AGE Technologies / LII Holdings / Crolex Holdings
7. Green Wish Partners
8. Kalahari Solar Power (PTY) Ltd
9. Actis GP LLP
10. Steag Energy Services
11. Mainstream Renewable Power South Africa
12. Dhamma Energy Management SL
13. Clean Fuel Solutions Limited
14. Intremar Consortium
15. Raajratna Energy Holding JV Tavasya Venture, S & S Water and Powe
16. Energevity
17. GMR Energy
18. Hive Energy Ltd
19. Biotherm Energy / Metka Industrial Construction SA
20. China Harbour Engineering Co Ltd
21. Kenrichie Investments / Region – 20 / Akuo Energy / Egis Group
22. Western Palace / Concor
23. Caraba JV Renewable Grid-Scale Energy Consortium
24. Genesis Energy Consortium
25. Korean Solar Power Consortium
26. Jinko Power
27. Purshota Profiles
28. GCL New Energy Africa Limited
29. Access Infra Africa Consortium
30. ECCO Smart Investment Solution Group
31. Goldenton Energy (PTY) Ltd
32. Green Fields Energy Botswana (PTY) Ltd
33. Head Wall Power International
34. Viridis Group
35. Neoen Renewing Energy
36. Infress – Formentera JV
37. Sozala Energy
38. Sepco III Electric Power Construction Corporation
39. Green Enesys
40. Shapoorji Pallonji Infrastructure
41. Jackson Engineers JV Africus Green Power
42. Szzt South Africa (PTY) Ltd
43. African Infrastructure Investment Managers
44. Technology and Management JV Iner-T, EIA Projects
45. Usizo Engineering JV Power Caves / Green LLC
46. Impianti Dabitron
47. Suncorp Solar Consortium
48. Phanes Renewable Energy
49. Paramount Technology and Retail
50. Acciona Energia Global – Swicorp Company
51. Abengoa South Africa
52. Shikun Binui Arison Group Renewable Energy
53. Solar Power Kalahari Resources Development Company / Unlimited I
54. Tata Power
55. Mikel Investments (PTY) Ltd
56. Africa Azania Petroleum and Gas Holdings JV Cyclamen
57. EDF Energies Novelles
58. Renew Solar Power Private Limited
59. Enel Green Power
60. Subsolar Energy Holding
61. Goodson Capital Partners JV Trans African Energy and Power (PTY) Lt
62. BNT Trust JV Grapevine Investment
63. Bright Source Limitless
64. WBHO Construction
65. Sturdee Energy
66. Simcoe Renewable Energy Corp
67. Enlight Eurecom Group JV Israel Electric
68. Africa Finance Corporation
69. Targetrite (PTY) Ltd
70. Ares Holdings LTD / Green Akter
71. Piosol Renewable Energy (PTY) Ltd
72. Solar Green Energy
73. Consolidated Constructors Group SAL
74. Everest Mills / MG Lighting / Shai Spotgany Consulting
75. Ergon Solar Photo – Voltaic Systems Consortium Comal Solar Energy
76. Photon Energy Systems JV Maps Electricals
77. New Generation Power Int LTD
78. Energy Capital Botswana (PTY) Ltd
79. Cater Mart
80. Prepaid Capital
81. Enerray SPA
82. Engie Southern Africa
83. Denergy Power LLC
84. Blue Energy Industrial Africa / Mosienyana & Partners Consortium
85. Trina Solar Co LTD
86. Scatec Solar
87. Boletsatsi Solar Consortium / Emvelo Holdings CEF / Murray and Rob Holdings
88. Diesel Electric Services
89. Itramas Technology SDN BHD
90. Wind Savers (PTY) Ltd
91. Grupo Cobra South Africa
92. Winch Energy Botswana
93. Yingli Energy China Co. Limited
94. Alcazar Energy Limited
95. Solar One / Bouyges and Windiga Energy JV
96. Jaquar Overseas
97. Rays Power Infra
98. Sky Power Global Group of Companies
99. Rays Power Infra JV Joina Consultants
100. GE Energy Connections
101. Green Energy Holdings Consortium
102. Korea Electric Power Corporation
103. Adenium Energy Capital
104. Globeleq Advisors Limited
105. PIL Projects Botswana JV Sun Brilliance Power
106. Terni Energia South Africa
107. Xago Africa
108. Argentum Energy
109. Atlantic Energy Partners
110. Sunworx
111. Loapi Energy
112. JCM Power
113. Haw and Inglis International Limited
114. Euro Technologies Resources PL
115. CSDR International / Africa Solar Power Corporation (2) Ltd
116. Solar Reserve
117. Inner Mongolia Electric Power Construction
118. Inuit Holdings (Pty) Ltd
119. Mulilo Renewable Project Development
120. Bitte Group
121. Grupotec Renewable Ltd
122. Solarpack Corporacion Technologica SL
123. Electnor SA
124. AEV Investment / Thobo Energy / British Solar Renewables JV
125. Synnove Energy, Black and Veatch and First Solar
126. Phelan Energy Group LTD
127. Aurora Group Aurora Power Solutions
128. Voltalia
129. SolAfrica Energy /Metier Sustainable Capital / Sener
130. Quantum Power / Inspired Evolusion Investment Management
131. Mertel Consortium/Mercury / Telenetix / Ampcontrol / Senet Engineering
132. Seul Holding / CPF Ventures
133. Avaada Power Private Limited
134. Huawei Technologies Botswana
135. DLO Energy Resources Project / JUWI /Shumba Energy
136. DWD Engineering
137. Total Solar
138. NTPC Limited
139. Bas Projects Corporation and Global Dominion Access SA
140. Sphere Power Inc / Thebe Energy Trading
141. FRV B.V
142. Spectratech (Pty) Ltd
143. China Railway International Group / Lead Engineering and Projects
144. Alte Technologies
145. AECOM /GE /Afritech Group
146. Resource Field Zimbabwe
147. Sumitomo Corporation Africa
148. Consolidated Infrastructure Group / Energy Botswana
149. Barclays Gedi Group / Kgalagadi Solar Power Resources
150. GS Energy Corporation / LS Industrial Systems / GS Engineering
151. Pele Green Energy (PTY) Ltd
152. China Machinery Engineering Corporation
153. Desert Technologies
154. Solar and Wind Systems SA (Pty) Ltd
155. KS Energy Power Africa (PTY) Ltd
156. Chint Electric Corporation / KT Corporation
157. First Solar / BPA / Solar Power
158. Korea Southern Power Co. Ltd / Daelim Energy Co. Ltd
159. Real Force Power JV Powacom Engineering
160. TBEA Co. Limited
161. Marubeni
162. Alfanar Energy / Enerpal International
163. Building Energy
164. Alten Renewable Energy Group
165. ACWA Power Botswana Solar Power Project
166. Cronimet Mining Power Solution GMBH

South African RE auctions (MW)

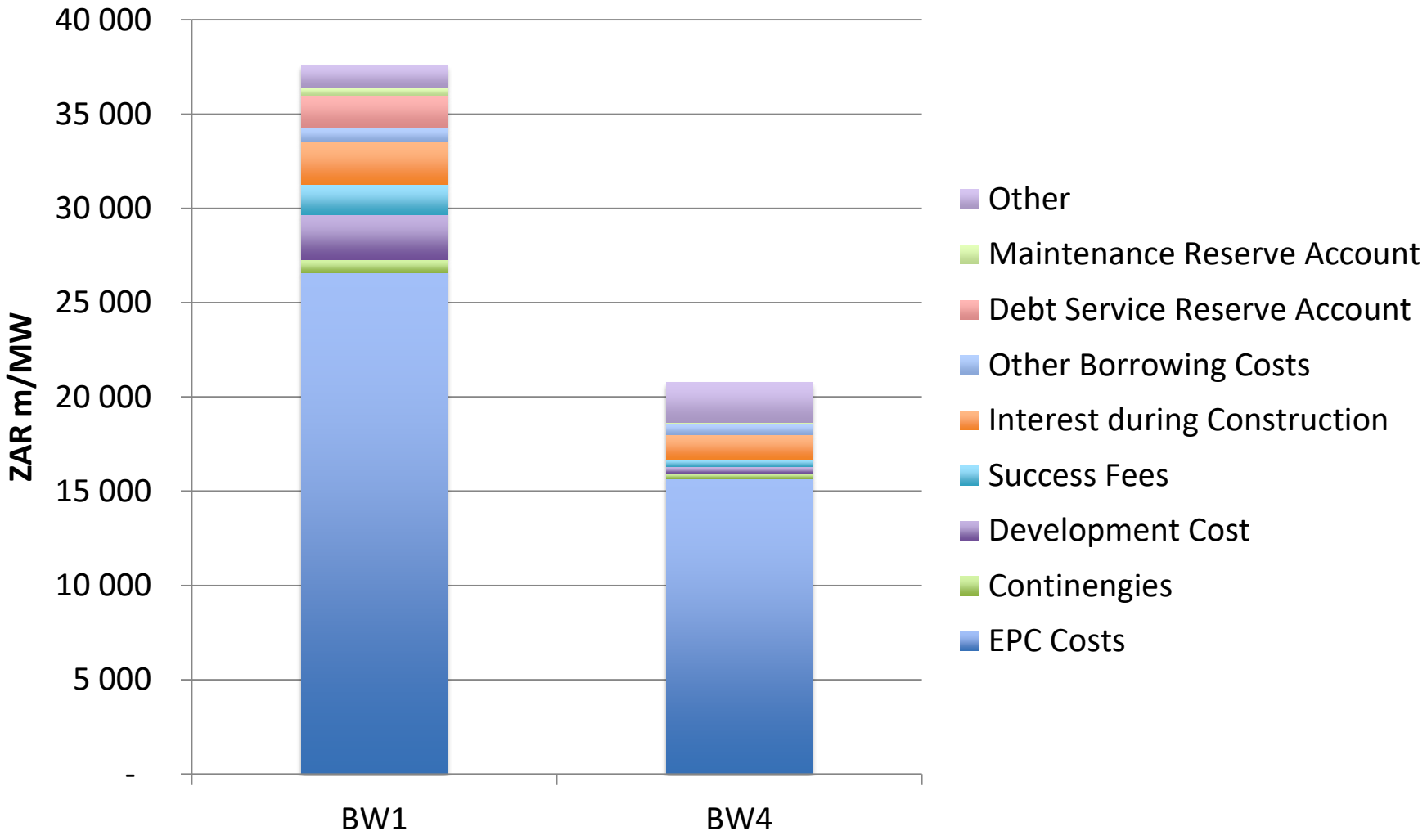


- US$ 20,5 billion private investment
- 102 projects
- 300+ bids
- 6327 MW auctioned
- All since 2011!

South African RE auction prices

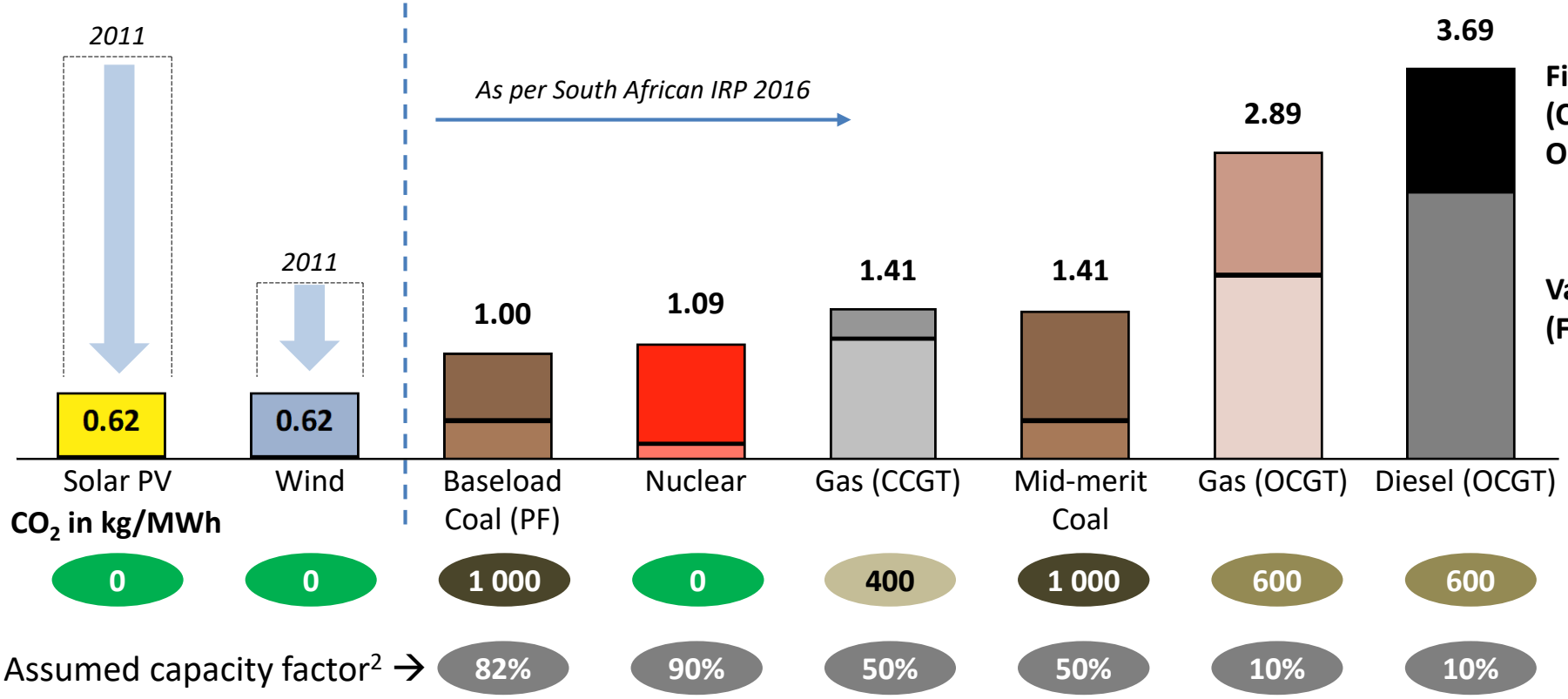


Breakdown of average investment costs per installed MW: Solar PV



Comparative LCOEs for new power sources in South Africa

Today's new-build lifetime cost per energy unit[1] (LCOE) in R/kWh (April-2016-Rand)



[1] Lifetime cost per energy unit is only presented for brevity. The model inherently includes the specific cost structures of each technology i.e. capex, Fixed O&M, variable O&M, fuel costs etc.
[2] Changing full-load hours for new-build options drastically changes the fixed cost components per kWh (lower full-load hours → higher capital costs and fixed O&M costs per kWh);
Assumptions: Average efficiency for CCGT = 55%, OCGT = 35%; nuclear = 33%; IRP costs from Jan-2012 escalated to May-2016 with CPI; assumed EPC CAPEX inflated by 10% to convert EPC/LCOE into tariff; Sources: IRP 2013 Update; Doe IPP Office; StatsSA for CPI; Eskom financial reports for coal/diesel fuel cost; EE Publishers for Medupi/Kusile; Rosatom for nuclear capex; CSIR analysis

SOUTH AFRICA RE AUCTION DESIGN

From feed-in tariffs to auctions

- Energy regulator published REFITs in 2009/11
- Feed-in tariffs were set at generous levels, assumed 17% real return on equity and prices indexed with inflation
- But resulted in no projects -> Eskom, the national utility delayed power purchase & connection agreements
- In 2009, South Africa made a voluntary commitment to UNFCCC to cap its carbon emissions (in the future)
- New power generation expansion plans in 2010/11 included solar and wind energy for first time
- In 2011, Department of Energy abandoned REFiTs and committed to running competitive tenders or auctions for new renewable energy capacity

South Africa RE auction process

- 2011 DoE issued RfP for 3625MW of PV, wind, CSP, SH & Bio
- 4 main auctions held to date (+CSP) – total 6300 MW
- Procurement caps for individual technologies Wind 140, PV 75, CSP 100 MW
- Price caps for each technology initially but not in later auctions
- Standard 20 yr, local denominated PPAs + IA + DA + CA
- No pre-qual, but compliance criteria, bids due 3 months after RfP
- Financial close 6 months after preferred bidder status (later in practice)
- CoD required within 18 months of financial close (3200MW by end 2016)

Evaluation Process

Compliance Criteria

- Structure of project
- Legal
- Land
- Environment
- Financial (due diligence by banks)
- Technical
- Economic development
- Bid guarantee

Evaluation Criteria

Price **70%**

Economic Dev **30%**

- Job creation
- Local content
- Ownership
- Management control
- Preferential procurement
- Enterprise development
- Socio-economic development

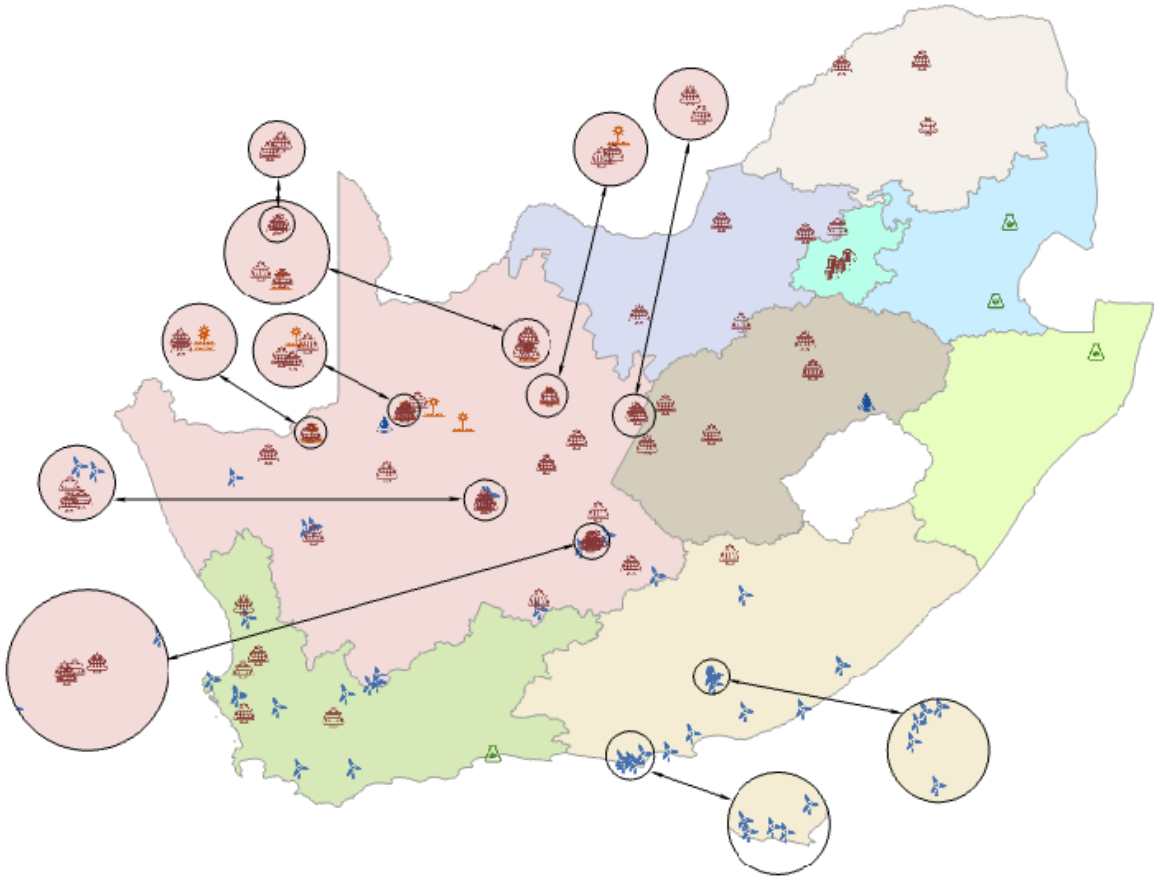
Economic development targets

Element (Weighting)	Description	Threshold	Target
JOB CREATION (25%)	RSA Based employees who are citizens	50%	80%
	RSA Based employees who are Black people	30%	50%
	Skilled employees who are Black people	18%	30%
	RSA based employees who are citizens and from local communities	12%	20%
	RSA based citizens employees per MW of Contracted capacity	N/A	N/A
LOCAL CONTENT (25%)	Value of local content spending	40% – 45%*	65%
OWNERSHIP (15%)	Shareholding by Black People in the Seller	12%	30%
	Shareholding by Local Communities in the Seller	2.5%	5%
	Shareholding by Black people in the Construction Contractor	8%	20%
	Shareholding by Black people in the Operations Contractor	8%	20%
MANAGEMENT CONTROL (5%)	Black people in Top Management	-	40%
PREFERENTIAL PROCUREMENT (10%)	BBBEE Procurement**	-	60%
	QSE & SME Procurement**	-	10%
	Women Owned Vendor Procurement**	-	5%
ENTERPRISE DEVELOPMENT (5%)	Enterprise Development Contributions***	-	0.6%
	Adjusted Enterprise Development Contributions***	-	0.6%
SOCIO ECONOMIC DEVELOPMENT (15%)	Socio-Economic Development Contributions***	1%	1.5%
	Adjusted Socio-Economic Development Contributions***	1%	1.5%

**Depending on technology. 45% for solar PV, 40% for all other technologies.*
***As percentage of total procurement spend.*
****As a percentage of Revenue*
Source: DOE (2014)

64 projects
3922 MW
from auctions 1, 2 & 3
completed or
under construction

Wide geographic project distribution



IPP Project status	OW	PV	CSP	SH	LG	BM
No financial close yet						
Under construction						
Operational						
Came online last quarter						
Expected to come online next quarter						
Completed – no Grid connection						

Not well co-ordinated with transmission planning and investments

Challenges and Risks

- Size and readiness of RE market initially overestimated and too much capacity tendered with insufficient competition in first auction
- Size and complexity of programme stretched available advisory capacity to the limit
- May have been more prudent to start smaller and then gradually ramp up programme
- Important to institutionalize procurement capacity
- Economic development criteria are arguably resulting in higher prices than could have been achieved
- Could improve local content and employment criteria
- **Incumbent utility can frustrate entire programme**
- Need better links with transmission planning and investment

LESSONS AND RECOMMENDATIONS

Competitive tenders	Feed-in tariffs
Potentially yield lower prices through market competition	No competition and excessive rents possible (but lower prices could be specified in subsequent rounds)
Higher transaction costs (offset, hopefully, by lower energy prices)	Lower transaction costs (but still need good design and evaluation)
More complex (narrows potential pool of developers)	Simpler (widens potential pool of developers)
Can include non-price criteria in evaluation to maximise economic development	Non-price criteria could be specified a priori
Less suitable for procuring small projects	Useful for procuring small projects
Allowed in most jurisdictions	Not allowed in some jurisdictions
Easier to integrate with transmission planning	Difficult to integrate with transmission planning
Primary objective in developing countries is to get more power at affordable cost	Objective in rich countries was to create economies of scale and eventually lower prices, and off-set carbon emissions

RE auction design elements

Source: IRENA (2015)

Lessons and Recommendations

1. Clear policy and enabling environment

- Enabling policy and RE targets
- Investors need certainty
- Linking RE policy, targets, planning and procurement

2. Mandated, authorised and coordinated leadership

- Political support
- Mandated & authorised champion and team to drive procurement
- Respected, credible & capacitated “Tender Agent”
- Coordination of government departments

3. Well-resourced procurement programme

- Sufficient resources for experienced transaction advisors
- Fees for ongoing costs

Lessons and Recommendations

4. Auction design built on international best practice

- Wide consultation
- Benchmarking
- Design elements: Two-stage vs. One-stage tender process; Sealed-bid vs. Open-bid tenders; Single bid round vs. Series of rounds; Volume auctioned; Technology specific vs. technology neutral; Project size limitations etc.

5. High quality, bankable documentation and contracts

- RFQ, RFP, PPA, IA
- Standardised, non-negotiable

6. Risk mitigation, credit enhancement and security measures

- Sovereign guarantees, DFI involvement, arbitration arrangements, letters of comfort etc.

Lessons and Recommendations

7. Fairness, transparency and trust

- Evaluations conducted under strict security conditions
- Thorough review process
- Meeting deadlines
- Strong communication with private sector

8. Competitive and accessible capital markets

- Debt funding for projects
- DFI support

9. Grid planning must be coordinated with the programme

Lessons and Recommendations

10. Site selection and preparation

- Govt provision and preparation of site can theoretically reduce costs and risks; but opposite can also be true
- Need private sector involvement throughout
- Limits project pipeline development

11. Utility/off-taker involvement

- Innovative ways of involving utility in programme beyond merely being the off-taker can mitigate LT risks (e.g. shareholding)

12. Legacy issues: moving from REFIT to auction

- Need to consider and clearly communicate what is to happen to FiT projects: complete replacement of FiT? FiT for smaller projects?

PPIAF
Enabling Infrastructure Investment

May 2014

South Africa's Renewable Energy IPP Procurement Program: Success Factors and Lessons

Anton Eberhard, University of Cape Town
Joel Kolker, World Bank Institute
James Leigland, Private Infrastructure Development Group

RECOMMENDATIONS FOR THE DESIGN
OF SUCCESSFUL RENEWABLE ENERGY AUCTIONS
OR COMPETITIVE TENDERS IN AFRICA
LESSONS FROM SOUTH AFRICA

Anton Eberhard and Raine Naude

DIRECTIONS IN DEVELOPMENT
Energy and Mining

Independent Power Projects in Sub-Saharan Africa

Lessons from Five Key Countries

Anton Eberhard, Katharine Gratwick, Elvira Morella, and Pedro Antmann

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RENEWABLE ENERGY AUCTIONS
IN SUB-SAHARAN AFRICA:
Review, Lessons Learned and Recommendations

Wikus Kruger & Anton Eberhard

November 2016

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THE SOUTH AFRICAN RENEWABLE ENERGY
IPP PROCUREMENT PROGRAMME
Review, Lessons Learned & Proposals to Reduce Transaction Costs

Anton Eberhard and Raine Naude

APRIL 2016

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Thank you for your attention

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University of Cape Town

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