KEY PERFORMANCE INDICATORS & FINANCIAL IMPLICATIONS OF THE USE OF RE TECHNOLOGIES

Water-Energy Nexus Operational Toolkit : Renewable Energy

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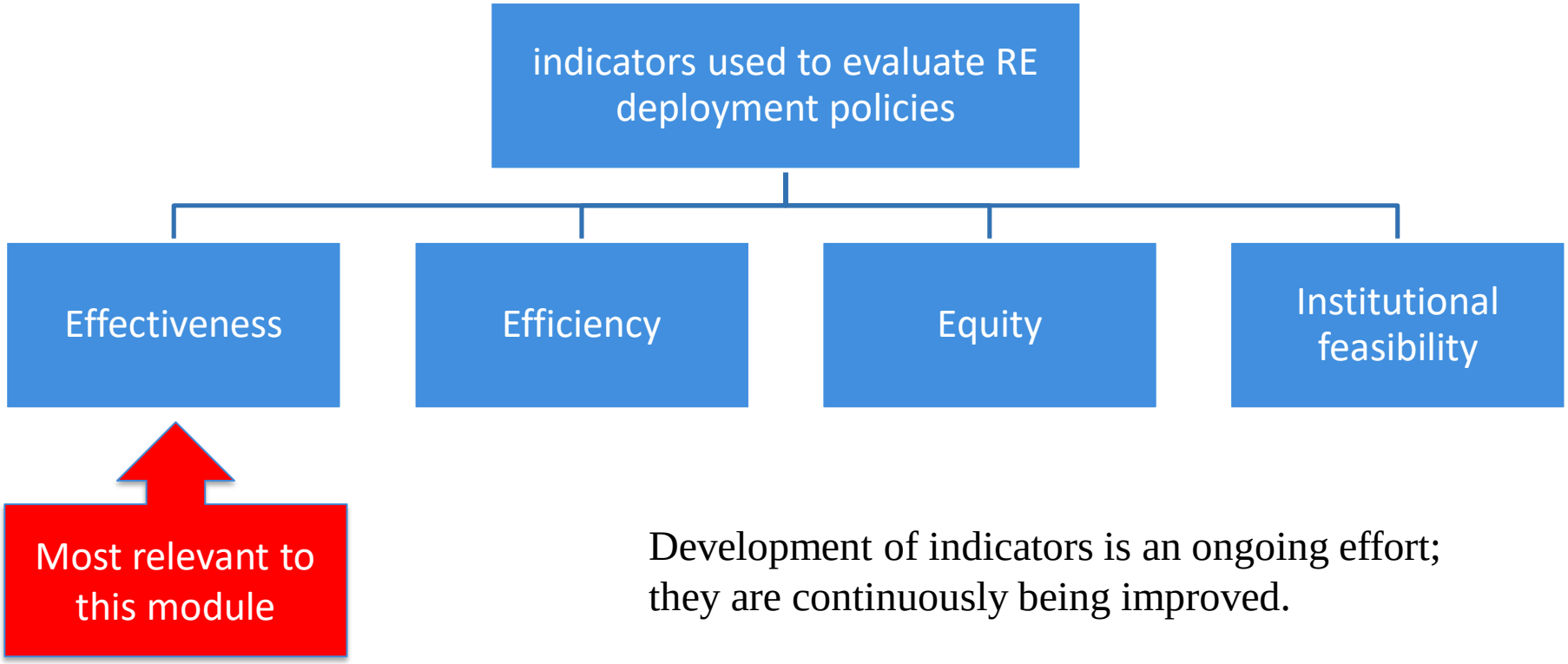
Performance indicators

Categories of indicators



Development of indicators is an ongoing effort; they are continuously being improved.

Performance indicators

Key RE effectiveness indicators

Indicator	Description	Data requirements
Installed capacity (MW)	Simplest indicator to employ. Does not capture operational performance.	Very low; Pipeline data may be included.
Electricity generated (MWh)	Captures operational performance.	Low
Meeting pre-existing government targets	Assesses link between achievements and targets, but without indication of scale of policy ambition.	Considerable.
European Commission (EC) effectiveness indicator	Measures deployment achieved in a given year as a percentage of remaining unexploited realizable potential to the year 2020. Does not take into account learning rates. Moving base year hinders longitudinal comparison.	Considerable data and technical capacity requirements to estimate realizable potential.
Policy impact indicator	Measures deployment (in terms of RE electricity generation) achieved in a given year as a percentage of new RE electricity generation deployment required between 2005 and 2030 to meet IEA WEO 450 projections. Use of static base year facilitates longitudinal comparison.	Considerable
Deployment status indicator	Quantifies maturity of national RE technology markets. Composite indicator combining: RET production as share of consumption; production as share of 2030 realizable potential; installed capacity.	Considerable

Key RE effectiveness indicators

Considering energy output may be considered better than considering capacity growth as the former provides information about how productive the RE technology has been.

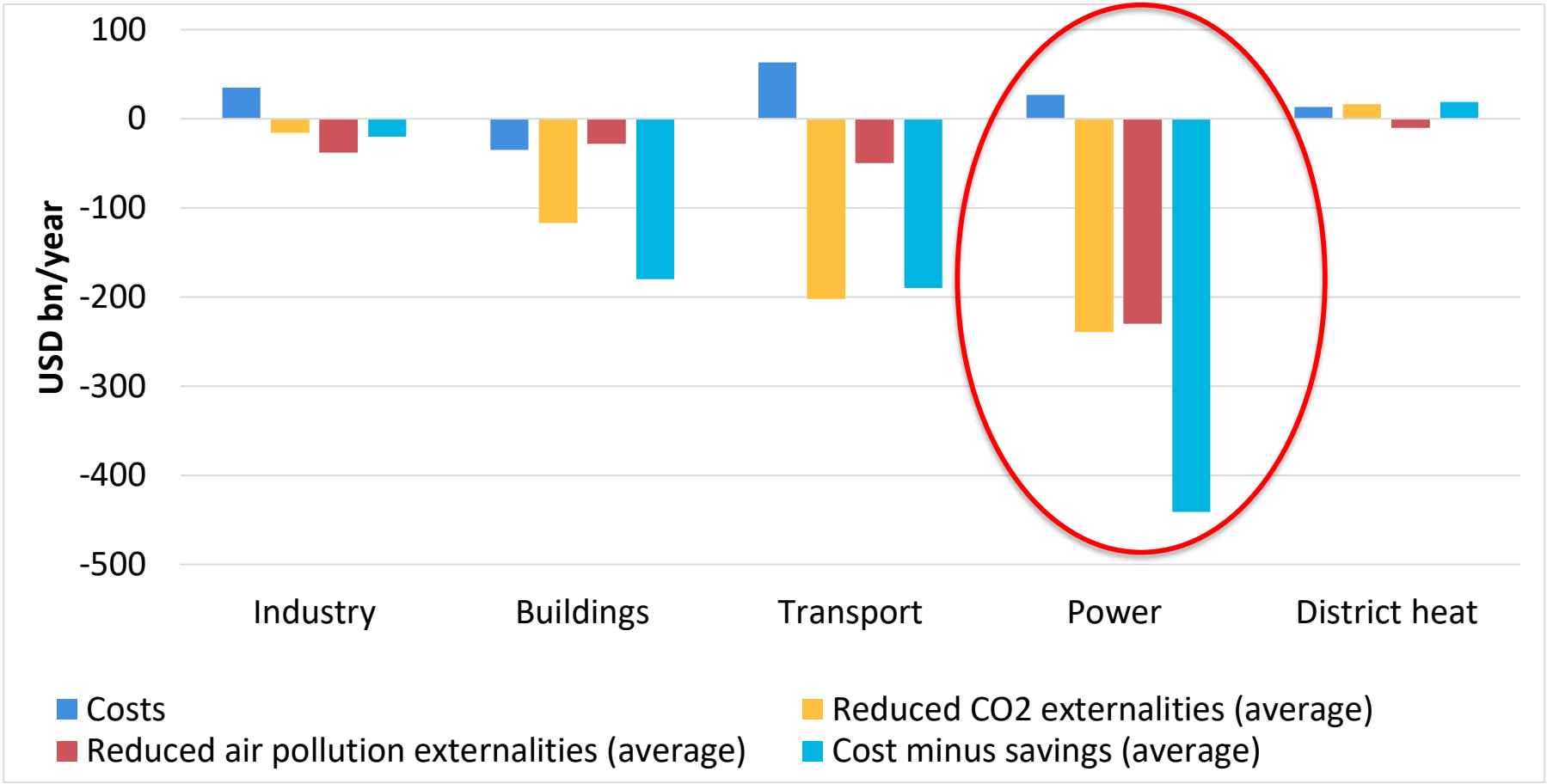
It is suggested that the European Commission Effectiveness Indicator be used as a primary indicator

Indicator for SDG 7: By 2030 expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries

Financial perspective

Financial perspective

Costs and savings of RE by sector in 2030



Source: IRENA, 2016a.

Cost to generate AD gas electricity

Electricity production processes

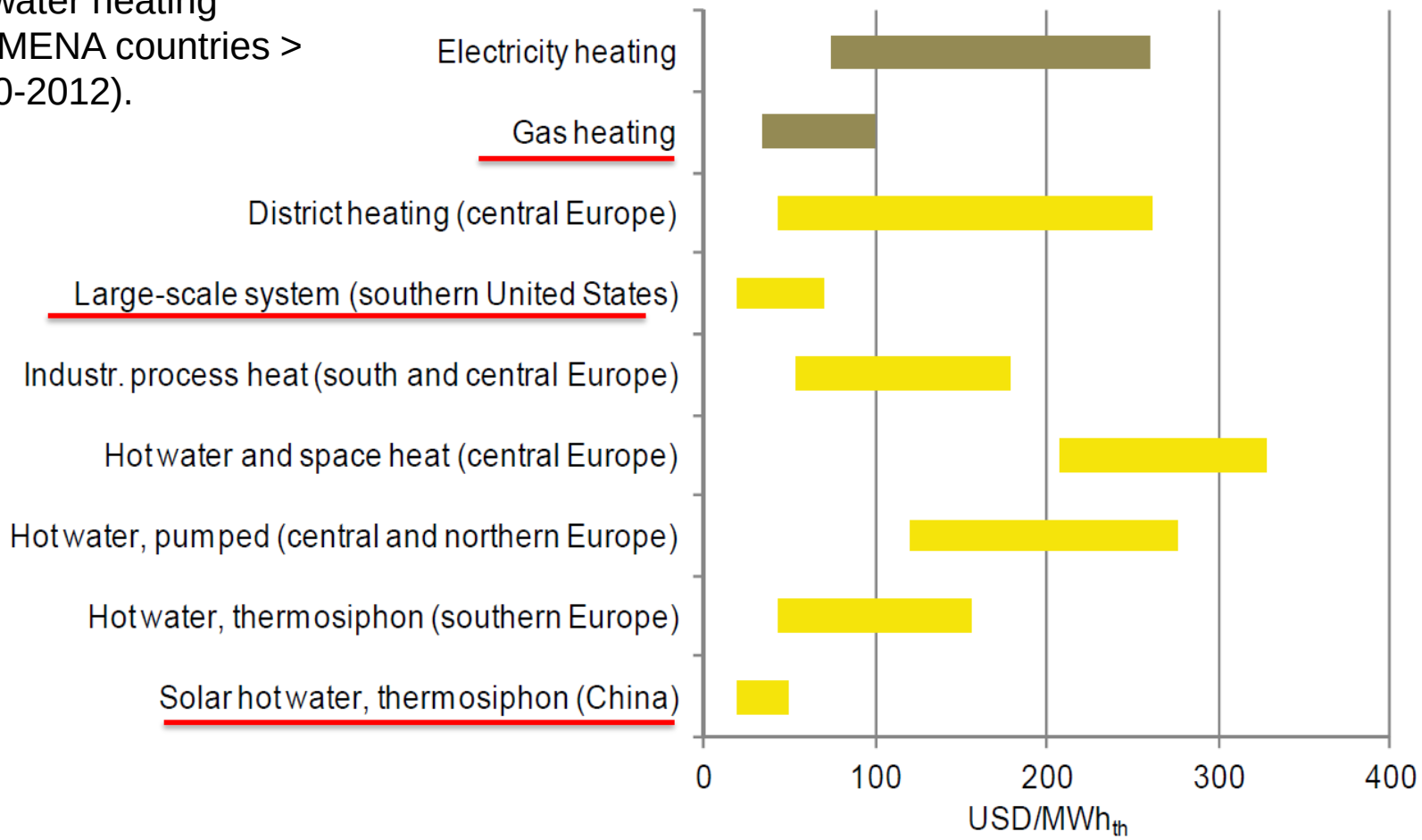
WWTF Plant Size (MGD)	Corresponding CHP System Size (kW)	Estimated Cost to Generate (US$/kWh)				
		Microturbine	Rich-Burn Engine	Fuel Cell	Lean-Burn Engine	Turbine
1–5	30–130	0.064	0.073	-	-	-
5–10	130–260	0.064	0.060	0.083	-	-
10–20	260–520	0.064	0.060	0.083	0.051	-
20–40	520–1,040	-	-	0.083	0.051	-
40–150	1,040–3,900	-	-	0.083	0.040	-
>150	>3,900	-	-	-	0.040	0.032

Current electricity price in the United States ~ $0.12/kWh

Source: Eastern Research Group, Inc. (ERG) & Resource Dynamics Corporation (RDC), 2011.

Solar heat production costs by region

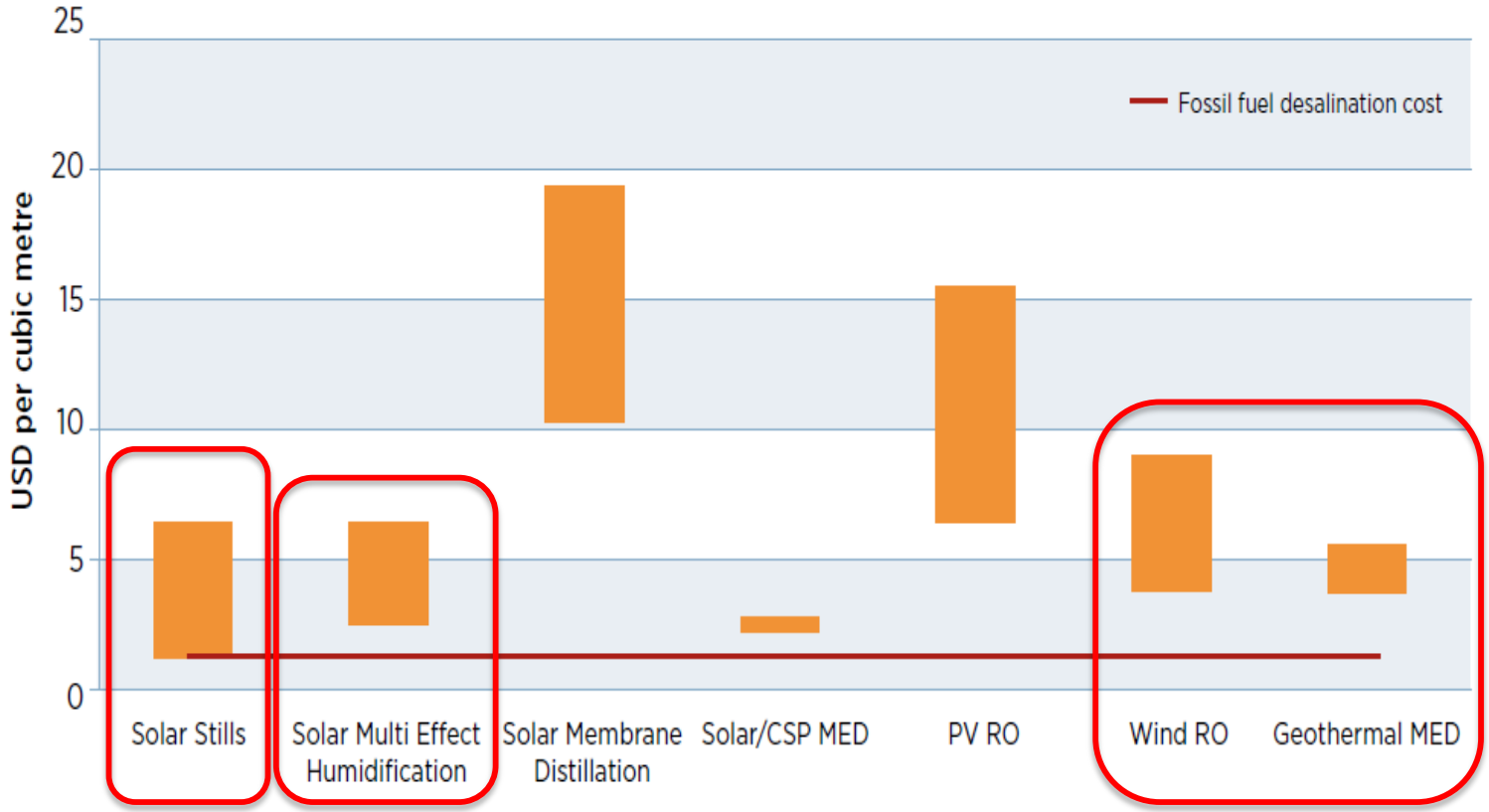
Installed solar water heating capacity in the MENA countries > 3000 MW (2010-2012).



Source: Eisentraut & Brown, 2014

Financial perspective

Desalinated water costs for RE-desalination processes



Source: IRENA, 2015a.

Financial perspective

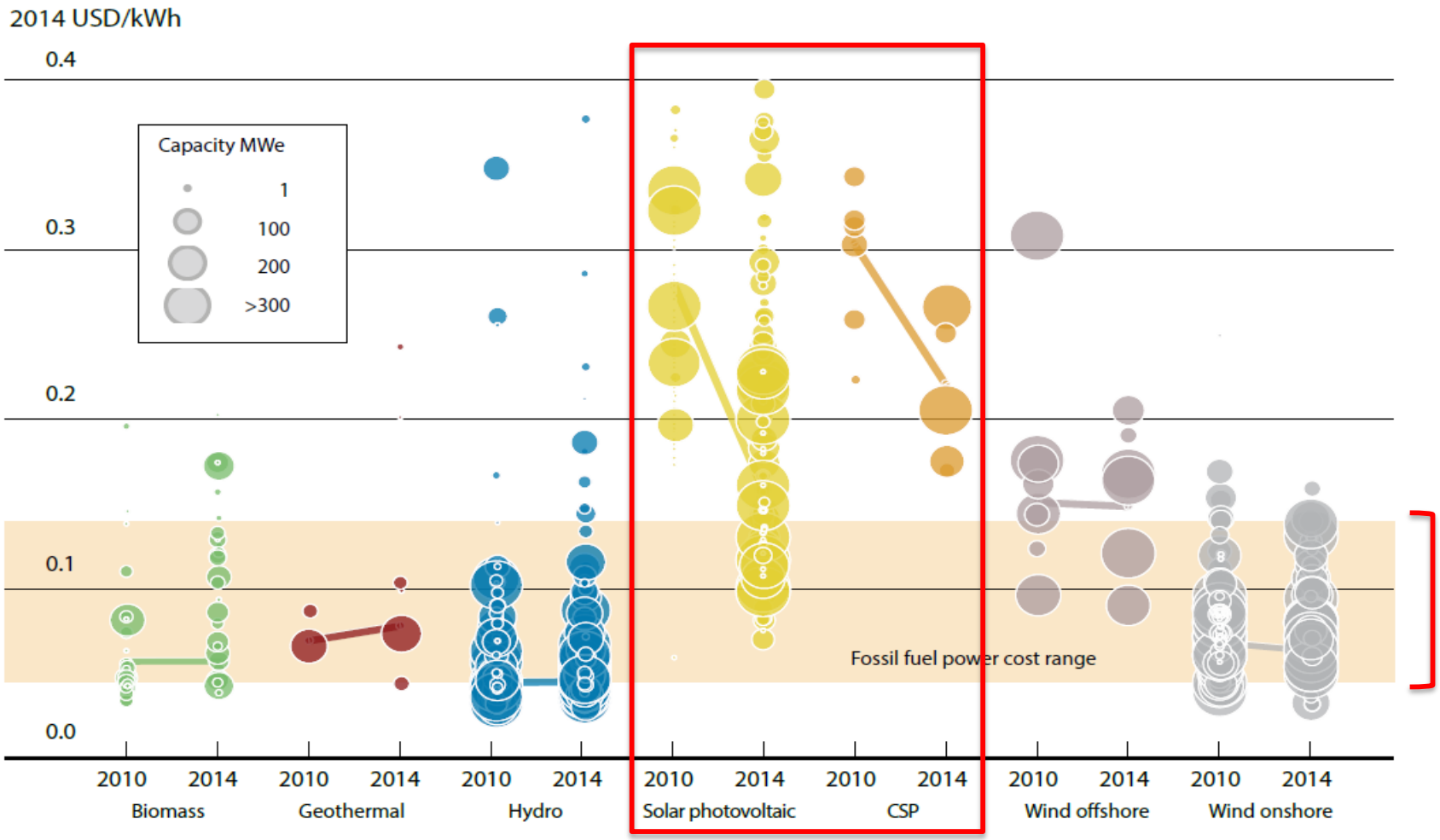
Capital costs of two main CSP desalination configuration options

	MED-CSP	RO-CSP + dry cooling
Capital cost-desalination (US$/m³)	3,136	1,748–2,425
Capita cost (CSP + PB) (US$/m³)	9,125	9,877–10,145
Total investment cost (US$/m³)	12,261	11,625–12,570
Breakdown of capital costs for CSP energy (%)		
Solar field	57	54
Thermal storage	21	20
Power plant	18	19
Back-up boiler	4	5
Cooling	0	2

Source: World Bank, 2012.

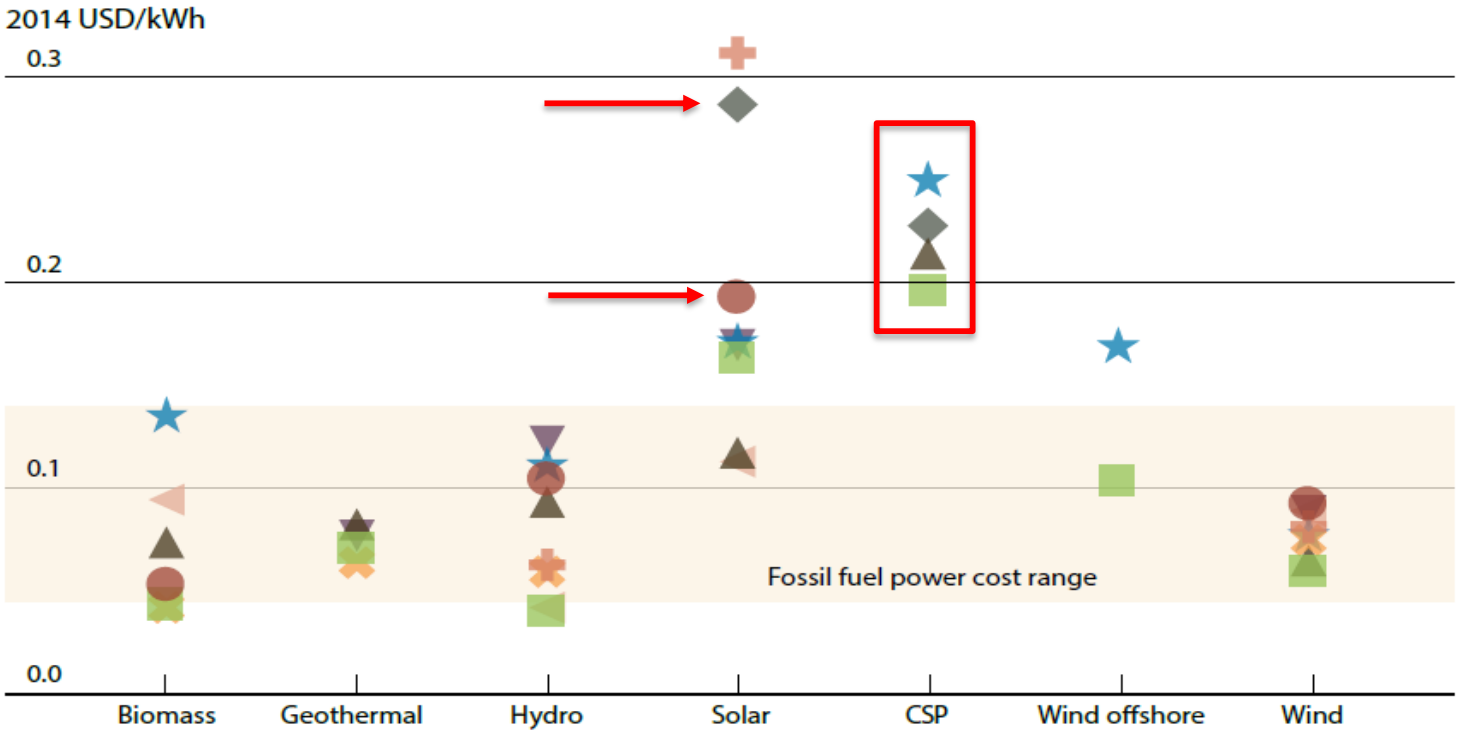
Financial perspective

Levelized cost of electricity from utility-scale RE in 2010 and 2014



Source: IRENA, 2015c.

Weighted average cost of electricity by region for utility-scale RE vs. fossil fuels 2013/2014



- Record-low bid: 2.42¢/kWh in Abu Dhabi in 2016 (cheapest solar PV power plant on record).
- From 2011 to 2016 the prices of solar technology decreased by almost 70%.

Source: IRENA, 2015c.

Key messages

- Indicators related to RE technology are still being developed.
  - This is also true for RE technology indicators related to the water-energy nexus.
  - The data required for these indicators can be difficult to obtain depending on the complexity of the indicator.
- The use of RE technology is expected to lead to increasing rates of savings, particularly in the power sector.
- RE desalination options must be developed further to reach economic viabilities comparable to those of desalination powered by conventional sources.
- The costs associated with RE technologies have decreased over the past few years and become comparable with those of fossil fuels.
  - The reduction has been most pronounced for PV technology.
  - CSP technology must develop further to be comparable with fossil fuels.

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