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Renewable energy market competence index part 2: Application to CSP technology☆

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ABSTRACT

The Renewable Energy Market Competence Index that was developed in a previous work is applied to concentrated solar power technology for 18 countries. The index score and rank show very high stability versus variation of the weighting parameter (α) used in the index. Except for only 3 countries (Algeria, Brazil, and Syria), the maximum absolute difference for the two extreme cases of the weighting parameter α for the remaining 15 countries is less than or equal to 10 points, and for 11 countries this difference is less than or equal to only 3 points. Similarly for the two extreme cases of the weighting parameter α, the rank does not change for 5 countries, changes by only 1 position for 7 countries, 2 positions for 1 country, 3 positions for 4 countries, and 7 positions for only 1 country (Algeria). In comparison with the Renewable Energy Attractiveness Index, the minimum correlation between the two common data sets of 11 countries of the two indices for both score and rank is approximately 85%. Despite of the relatively large difference in score (17–22 points) for 3 countries (South Africa, Greece, and Tunisia), the difference in the remaining 8 countries does not exceed 7 points. The analysis of rank difference shows that 5 countries have the same rank in both indices, and that the maximum rank change is only 3 places for only 2 countries.

1. Introduction

In Part 1 of this work [1], a methodology for Market Competence Index for each RE technology and a combined RE Market Competence Index were developed. Here, the proposed methodology is applied to calculate CSP Market Competence Index as it is the main technology of choice – in addition to wind and PV but with a lesser weight – for the MENA region for many regional initiatives like Mediterranean Solar Plan and DESRTECH. Since the technology specific indicators were described in Part 1 of this work [1], here the starting point is to calculate these indicators for CSP technology in Section 2. This is followed in Section 3 by calculating the CSP Market Competence Index, investigating the effect of varying the weighting parameters (α). Then in Section 4, the scores and ranking of the CSP Market Competence Index is compared with the CSP component of the Country Attractiveness Index, followed by critique and possible improvement of the proposed index in Section 5, and the conclusion in Section 6.

2. CSP technology indicators

2.1. CSP manufacturability indicator

Applying the proposed methodology for the manufacturability indicator described in [1] on CSP technology suggests the following:

- **First**, the CSP technology is broken down into its main industries; namely Glass Industry, Electronic and Electrical Industry, and Steel Industry [2].
- **Second**, each industry is broken down into more detailed ingredients as shown in the first 2 rows of Table 1.

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Table 1
Point system of the CSP manufacturability questionnaire based indicator.

Points	Glass industry					Electronic and electrical industry			Steel industry		
	Local availability of raw material	Float glass manufacturing capacity	Glass transformation (mirror)	Glass bending	Glass coating	Cabling industry	Electronic and electrical industries	R&D	Steel production capacity	R&D	Piping and insulation capacity
0	NA	Far less than the current needs of the country by more than **four** 150,000 T/y plant each	NA	NA	NA	NA	NA	<10	Steel production index described in Appendix I	NA	NA
1			Available but not for CSP technology					$10 \leq x < 25$		$10 \leq x < 25$	
2						Exist but not for high power sector		$25 \leq x < 50$		$25 \leq x < 50$	
3		More than the current national consumption by **less** than 150,000 T/y	Available for CSP technology with less than national demand		Available but not for CSP application		Assembly lines of electronic equipments	$50 \leq x < 75$		$50 \leq x < 75$	Just sufficient for current national demand
4						Exist for high power sector but capacity is less than demand		$75 \leq x < 100$		$75 \leq x < 100$	
5	Yes	More than the current national consumption by **more** than 150,000 T/y	Available for CSP technology with more than national demand	Available	Available for CSP application and with necessary accuracy	Exist for high power sector but capacity is more than demand (exporting)	Highly advanced (from SC industry up to devices and equipment)	≥100		≥100	More than national needs

Table 2
CSP questionnaire values, and CSP manufacturability indicator score.

Country	Glass					Electronic and electrical			Steel industry			Average glass	Average electronics	Average steel	CSP Manufacturability indicator score
	Local availability of raw material	Float glass manufacturing capacity	Glass Transformation (mirror)	Glass bending	Glass coating	Cabling industry	Electronic and electrical industries	R&D	Steel production capacity	R&D	Piping and insulation capacity				
Algeria	5	5	0	0	0	0	3	0	0.17	0	5	2.00	1.00	1.72	34
Egypt	5	5	1	0	0	5	3	2	0.71	0	5	2.20	3.33	1.90	44
Jordan	5	0	0	0	0	0	0	0	0.23	0	5	1.00	0.00	1.74	24
Lebanon	0	0	0	0	0	0	0	0	0.00	0	0	0.00	0.00	0.00	0
Libya	5	0	0	0	0	0	0	0	1.66	0	0	1.00	0.00	0.55	13
Morocco	5	0	0	0	0	2	4	0	0.14	0	5	1.00	2.00	1.71	30
Syria	5	0	0	0	0	0	0	0	0.03	0	0	1.00	0.00	0.01	7
Tunisia	5	0	1	0	0	2	3	0	0.13	0	0	1.20	1.67	0.04	14
Brazil	0	5	5	5	3	5	5	0	1.58	0	5	3.60	3.33	2.19	57
Turkey	0	5	5	5	3	5	5	0	3.40	0	5	3.60	3.33	2.80	63
Spain	0	5	5	5	5	5	5	5	3.71	0	5	4.00	5.00	2.90	72
Greece	0	5	5	5	3	5	5	5	1.97	0	5	3.60	5.00	2.32	63
South Africa	0	5	5	5	0	5	5	0	1.51	0	5	3.00	3.33	2.17	53
Malaysia	0	5	5	5	3	5	5	0	2.10	0	5	3.60	3.33	2.37	59
India	0	5	5	5	5	5	5	0	0.42	0	5	4.00	3.33	1.81	56
China	0	5	5	5	5	5	5	5	3.39	0	5	4.00	5.00	2.80	71
USA	5	5	5	5	5	5	5	5	2.69	5	5	5.00	5.00	4.23	92
Germany	0	5	5	5	5	5	5	5	5.00	5	5	4.00	5.00	5.00	93