

# The Sustainable Power Source speculation in Conceptual System and Exact Discoveries

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## Abstract

Interests in sustainable power source (SPS) advancements are viewed with expanding enthusiasm as a viable way to animate development and quicken the recuperation from the ongoing money related emergency. However, in spite of their intrigue, and the various strategies executed to advance these innovations, the dispersion of SPS ventures remains by one way or another underneath desires. This restricted entrance is likewise because of an absence of suitable financing and to a specific hesitance to put resources into these innovations. So as to reveal insight into this marvel, in this paper we look at the basic leadership process basic interests in SPS advancements. We propose and test a theoretical model that looks at the auxiliary and social elements influencing the choices of financial specialists just as the connection between SPS speculations and portfolio execution. Applying econometric methods on essential information gathered from an example of European financial specialists, we ponder how the speculators from the earlier convictions, their inclinations over approach instruments and their demeanor toward innovative hazard influence the probability of putting resources into SPS ventures. We additionally show that portfolio execution increments with an expansion of the SPS share in the portfolio. Suggestions for researchers, financial specialists, innovation administrators and approach producers are inferred and talked about.

**Keywords:** Development, Energy, Resources, Renewables.

## INTRODUCTION

In the World Energy Outlook 2009 (IEA, 2009a), the International Energy Agency dispatches an incredibly clear and convincing message: current vitality strategies can't be kept up on the off chance that we need to maintain a strategic distance from calamitous ramifications for the atmosphere. A "vitality innovation upset" is called for, so as to meet the difficult target of splitting CO<sub>2</sub> outflows by 2050 contrasted and 2005 dimensions (IEA, 2008a). "The undertaking is pressing; we should guarantee that venture choices taken currently don't abandon us with wasteful, high-radiating innovations in the long haul" (IEA, 2009b, page 1). It appears that another period is going to begin, where sustainable power source innovations are never again considered a "Cinderella alternative" (Grubb, 1990) yet are progressively observed as "survival

advances" (Leggett, 2009). To expand the offer of renewables in the worldwide vitality blend, huge developments are required in the specialized field, yet in addition in the social and institutional setting (Krewitt et al., 2007). Improved approach systems for sustainable power sources are required, which right externalities and guarantee a progressively level playing field. Besides, participation among open and private on-screen characters should be fortified. The two gatherings assume a key job. Arrangement creators ought to make motivations to guarantee that the fundamental ventures are embraced (IEA, 2007). Thus, the private area can assume an essential job in raising the required money related assets to encourage the progress towards a low-carbon economy.

Vitality examiners gauge that immense extra ventures are expected to

understand this change to a low carbon economy. Obviously, this is especially testing in the current monetary setting, as financial specialists are hesitant to do as such except if devoted strategies are actualized to animate sustainable power source speculations. As of late, a gathering of 181 speculation institutions which by and large speak to resources for 13 trillion US dollars has expressed that reasonable and suitable long haul arrangement signal are fundamental to enable financial specialists to coordinate environmental change considerations into basic leadership forms and reallocate cash-flow to low-carbon advancements (UNEP FI, 2009). In fact, it appears that the primary boundary to interests in ozone harming substance moderation advances isn't the absence of capital, yet rather the absence of proper strategy bundles to pull in it (Usher, 2008a). In actuality, numerous arrangements actualized so far have accomplished just halfway outcomes, since they have been unfitted to use the genuine drivers of the venture choice procedure.

A developing assortment of writing has begun examining how approaches ought to be intended to assemble interests in the sustainable power source area. A few examinations at the EU level have given a measure to approach viability (EC SEC, 2008; OPTRES, 2007; PROGRESS, 2008). However, albeit recognized, these examinations give just constrained experiences into the financial specialists' point of view.

The paper makes a few commitments. Initially, by giving a superior comprehension of the financial specialists' basic leadership process, the examination will help approach creators structure progressively powerful strategy instruments to help the market arrangement of sustainable power source advancements. Second, by stretching out the exact examination to a wide scope of institutional financial specialists, the paper makes a methodological commitment as well. Up until this point, the few examinations in this field have concentrated on a limited gathering of financial specialists, to be specific investors. By growing the extent of the investigation to a more extensive arrangement of budgetary on-screen characters, this work will add to expand the legitimacy of past discoveries to a more extensive and progressively broad setting.

The rest of the paper is organized as pursues: the following area surveys the most significant writing and the hypothetical establishments of our work. Segment 3 displays a reasonable model connecting speculators' convictions, venture choices and execution. Segment 4 portrays the exploration plan and the observational strategies utilized to test the model. Segment 5 shows the fundamental discoveries. At long last, Section 6 features the principle ends and talks about suggestions for hypothesis and practice.

## **SUSTAINABLE POWER SOURCE SPECULATIONS AND MONETARY EXECUTION**

Interests in sustainable power source advances have expanded relentlessly in the course of the most recent years. Examiners gauge that from 2002 until the finish of 2009, the efficient power vitality showcase has pulled in more than USD 650 billion in total (NEF, 2009a; UNEP and NEF, 2009). The years 2006 and 2007 have encountered twofold digit development, while 2008 and 2009 have been influenced by the results of the worldwide money related emergency, which has affected the perfect vitality advertise both straightforwardly (through a liquidity crush) and by implication (by means of a general fall in worldwide vitality request related with lower oil and gas costs). Despite the fact that the financial downturn has hit the sustainable power source advertise harshly, specialists trust that in the long haul the perfect vitality part ought to recuperate preferable and quicker over others. Numerous administrations have propelled green financial estimates that have added to direct the fall of interests in this industry. Besides, the IEA as of late required a "Clean Energy New Deal" to abuse the money related and financial emergency as a chance to instigate a changeless move in contributions to low-carbon innovations.

## **APPROACH INCLINATIONS AND ADEQUACY**

Approach targets and measures have been set by a few nations worldwide to help the organization of sustainable power source advancements. As indicated by REN21 (2010) in excess of 80 nations have effectively settled sustainable power source approaches. Approaches can assume a vital job in diminishing the hazard related to a venture

choice, by giving a steady system and diminishing business sector vulnerability.

As pointed out by Ecofys (2008) "duty, security, unwavering quality and consistency are for the most part components that expansion certainty of market performing artists, lessen administrative dangers, and thus fundamentally decrease the expense of capital". In any case, the connection among strategies and venture streams in a dynamic domain isn't direct. Once in a while even goal-oriented arrangement targets are not ready to catalyse speculations. Surprisingly more dreadful, the approach system is once in a while seen as a potential hazard factor as such. Truth be told, strategies and supporting measures can likewise change, subsequently influencing the benefit of ventures. Precedents are changes in – or notwithstanding completion of – the strategy bolster plans or changes in the market structure. As most markets for clean advancements are controlled under arrangement plots, this hazard is of specific significance for sustainable power source advances (Ecofys, 2008).

An undeniably applicable assortment of writing is researching the job of open controllers, by taking a gander at how approaches ought to be intended to animate the development of sustainable power source innovations. Researchers have widely debated over the viability of various strategy emotionally supportive networks in accomplishing approach destinations. For example, Menanteau et al. (2003) have featured the positive job of feed-in taxes in prompting an expansion of the sustainable power source share by bringing down the hazard related with the venture choice. Different investigations offer help to the theory that feed-in duties are an increasingly powerful arrangement conspire, contrasted with market-based methodologies (Butler and Neuhoﬀ, 2004; Sawin, 2004). Conversely, different investigations demonstrate that the shrouded expenses of feed-in levies may counterbalance their advantages by deciding liabilities in the long haul (Liebreich, 2009).

As these elective points of view recommend, there is expanding proof that strategy viability ought to be estimated along a more extensive arrangement of qualities, which fuse the kind of help conspire as well as

other imperative attributes, for example, the structure of the managerial system, and the dimension and term of the help gave to sustainable power source ventures. For instance, the IEA (2008b) has discovered that feed-in duties and tradable green declarations can be similarly compelling in advancing the sustainable power source advertise contingent upon the innovation and on some nation explicit conditions. It is somewhat the adherence to key approach plan standards and the rationality of arrangement estimates which decide the adequacy and effectiveness of sustainable power source strategies. This investigation affirms past discoveries (Held et al., 2006), which have just featured the imperative job of long-haul strategy systems that empower the effective conferment of sustainable power source advancements by giving clear flags to the market.

While these investigations have concentrated for the most part on the arrangement level, other exact works have begun fusing the speculator's point of view into the image, in order to comprehend the mentality of budgetary performing artists versus the different strategy instruments accessible. Specifically, Burer and Wustenhagen(2009) have studied an example of 60 investment and private value assets to break down financial specialists' inclinations for various kinds of help plans. Similarly, Luthi and Wustenhagen (2009) have analysed the impact of a lot of strategy traits on the venture choices of an example of European PV venture engineers.

These investigations have the unmistakable value of revealing further insight into the connection among approaches and speculation choices by joining the financial specialists' point of view into the image. However, by neglecting the job that social elements play in this procedure, they speak to just an initial move towards a superior comprehension of the connection between strategy instruments and venture choices. The present paper means to supplement and broaden this writing, by looking at how subjective components and conduct elements and disposition towards innovative hazard impact a performing artist's eagerness to put resources into sustainable power source ventures. We trust this is an imperative

commitment to the writing, on the grounds that consolidating these elements can give a significantly more exact depiction of the connection among arrangements and ventures and, at last, to the structure of better and increasingly successful strategy instruments.

### **SOCIAL COMPONENTS INFLUENCING VENTURE CHOICES**

The possibility that operators are not completely balanced and that social elements may emphatically influence human choices isn't new. Since the spearheading work of Simon (1957) it has increased expanding acknowledgment in various orders, including financial aspects (Van Zandt, 1999), and activities the executives (Loch and Yaozhong, 2005; Bendoly, 2006; Gino and Pisano, 2008). However, it has been only from time to time connected to consider interests in sustainable power source advancements.

Conduct account follows its underlying foundations back to the original work by Amos Tversky and the Nobel Laureate Daniel Kahneman during the 1970s. The two creators tested the ideal sanity rule by applying a psychological brain science point of view to dissect the most widely recognized misperceptions in numerous basic leadership forms. They contended that individuals will in general depend on a progression of heuristics when making of sustainable power source ventures. To this end, the conduct factors influencing the financial specialists' choices, just as the connection between sustainable power source ventures and portfolio execution.

### **METHODS**

The investigation is an example of cross-sectional information gathered by the creators by means of an online review. The examination configuration incorporated a blend of subjective and quantitative strategies (Black, 1999; Snow and Thomas, 1994) and was verbalized into three stages. In the primary stage, narrative investigation and meetings with specialists were done to test and refine the reasonable model and to guarantee content legitimacy for the different developments. Extraordinary consideration was devoted to the social money writing so as to operationalize and approve the subjective factors in the model (Menichetti, 2008). In the second period of the examination, an online

review survey was created, pre-tried, and controlled to an example of European financial specialists. In the third stage, the information was investigated by methods for versatile conjoint examination (Luce and Tukey, 1964; Green and Srinivasan, 1978; Johnson, 2001; Louviere and Woodworth, 1983) and multivariate relapses.

As examined more in detail beneath, the motivation behind the poll was both to create legitimate psychometric estimations dependent on Likert scales and to inspire approach inclinations through versatile conjoint investigation. This technique was wanted to subjective positioning for deciding speculators' inclinations for methodological reasons. By deducing the utility of each quality from the respondents' exchange off choices, versatile conjoint investigation does not require the specialist to make direct inquiries on the attractive quality of the picked property levels. In this regard, conjoint investigation offers the favourable position to copy the basic leadership process, in actuality, circumstances (Orme, 2009). Despite the fact that the utilization of conjoint examination isn't profoundly new in the executives and entrepreneurial look into (see for instance: Birley et al., 1999; Dufhues et al., 2004; Landstrom, 1998; Muzyka et al., 1996; Riquelme and Rickards, 1992), to the creators' information this paper speaks to one of the most punctual endeavours to apply this method to survey financial specialists' inclinations over sustainable power source strategy attributes (a comparative analysis was directed by Luthi and Wustenhagen, 2009).

### **THE REVIEW INSTRUMENT**

The poll secured four primary territories and included 35 explicit inquiries. The primary segment went for deciding the dissemination of sustainable power source speculations. Respondents were solicited to demonstrate the offer from their venture portfolios allotted to renewables and the particular advancements incorporated into their portfolios. It merits featuring that the term "portfolio" was utilized extensively. In our examination we focused on a differentiated gathering of financial specialists, who had diverse profiles and were included at various phases of the innovation esteem chain. Along these lines, given the diverse idea of the

speculations these specialists embrace, it was impractical to give a typical definition to the term portfolio. So as to dodge conceivable errors and to amplify the generalizability of our outcomes, in the poll respondents were expressly welcomed to consider the most delegate venture attempted by their organization and to allude to this speculation.

The motivation behind the second segment was to survey the speculators' information and attention to the mechanical and market capability of sustainable power sources, there from the earlier convictions about the job of market and strategy in supporting the development of renewables, just as their frame of mind toward innovative advancement.

The third segment was devoted to inspire inclinations for sustainable power source arrangements. Respondents were solicited to think about a number from elective arrangement alternatives to help a coastal breeze venture, which varied in the kind of strategy conspire actualized, dimension of help, span of the help, length of the authoritative procedure and level of social acknowledgment.

The fourth segment of the poll was committed to execution evaluation: respondents were requested to give a self-appraisal of the apparent past execution and of the normal future execution of their ventures contrasted with their immediate rivals. These were characterized as different financial

specialists working in a similar market. At long last, the survey likewise incorporated a progression of statistic addresses covering the organization profile, the financial specialists' involvement with sustainable power source speculations, just as their age, their instructive foundation and their situation in the associations.

## TEST CHOICE AND TEST ATTRIBUTES

As an initial step of the information accumulation process, a database of target respondents was created in the primer periods of the exploration venture. Contact subtleties of organizations and their senior delegates were assembled from various sources including the sites of the European Venture Capital Association and its national subsidiaries, The Business Place site and other specific catalogues. Extra wellsprings of data utilized incorporated the arrangements of members to probably the most presumed worldwide gatherings on reasonable vitality money, for example, the Wind Energy Conference for Equity Investors, the Sustainable Power Source Finance Forum, the New Energy Finance Summit. Generally speaking, a rundown of around 300 contacts in different European nations was gathered. Financial specialist profiles incorporate investors, private value reserves, resource supervisors, venture reserves, business banks and vitality organizations.

Table 1

<b>Exposure to the RE investing domain</b>		
Yes	62	67
No	31	33
<b>Investment by technology</b>		
Solar photovoltaic	36	57
Wind onshore	29	47
Biomass	21	33
Solar thermal	15	24
CSP	14	23
Hydropower	13	21
Wind offshore	12	19
Geothermal	11	17
Biofuels	4	7
Tidal/Wave	3	5
<b>Share of renewables in the investment portfolio</b>		
Less than 5%	12	19
From 5% to 9%	6	10
From 10% to 49%	16	26
From 50% to 99%	11	18
I only invest in renewables	17	27
<b>Experience in the RE investing domain</b>		
No experience	10	16
Less than 5 years	29	47
From 5 to 10 years	17	27
More than 10 years	6	10
<b>Company profiles</b>		
Venture capital, private equity or hybrid	34	37
Banks, hedge funds, pension funds and insurance companies	10	11
Project developers and utilities	5	6
Infrastructure Funds	4	4
Private companies	8	8
Engineering/other	5	6
No response	26	28
<b>Age of respondents</b>		
Under 30 years	10	11
From 31 to 40 years	35	37
From 41 to 50 years	11	12
More than 50 years	6	7
No response	31	33
<b>Educational background</b>		
Economics and business administration	24	25
Finance	16	18
Legal	2	2
Engineering	24	25
Multidisciplinary	27	29

The organization of the overview occurred. Prior to propelling the review, a protest with a predetermined number of financial specialists from the example and other significant partners was led so as to approve the estimation and refine the exploration instrument. The speculators chose for the full-scale review got singular solicitations by means of email. Updates were likewise sent at normal interims. Besides, a connection to the review was posted on the UNEP Sustainable Energy Finance Initiative site. So as to constrain the effect of self-evaluation and amplify the exactness of reactions, we pursued Huber and Power's (1985) rules: we ensured that the data gathered would remain totally classified; we consented to circulate a customized input record and we guaranteed to share the last aftereffects of the Table 2

examination with respondents. We got 136 reactions. In any case, 43 reactions must be disposed of in light of the fact that they were either obviously inconsistent or significantly fragmented. Thus, 93 surveys were eventually held for the examination, relating to a powerful return rate of 31%, which is in accordance with investigations of this nature.

## RESULTS

As a matter of first importance, it merits flagging that the observational examination delineates a business setting commanded by profoundly objective and all around educated financial specialists, who will in general limit the danger of their decisions by establishing their choices on authentic, specialized data.

	OLS			2SLS			SUR			3SLS		
	Estimate	Std Err	p	Estimate	Std Err	p	Estimate	Std Err	p	Estimate	Std Err	P
<i>RE share in the investment portfolio</i>												
Confidence in market efficiency	0.34	0.25	0.18	0.34	0.25	0.18	0.32	0.25	0.19	0.29	0.25	0.25
Confidence in technology effectiveness	0.81	0.22	0.00	0.81	0.22	0.00	0.83	0.22	0.00	0.86	0.22	0.00
Technological risk attitude	-0.37	0.09	0.00	-0.37	0.09	<0.001	-0.37	0.09	<0.001	-0.36	0.09	<0.001
Perceived importance of policy type	0.41	0.37	0.28	0.41	0.37	0.28	0.38	0.38	0.31	0.32	0.38	0.41
Perceived importance of support level	-1.29	0.50	0.01	-1.29	0.50	0.01	-1.27	0.50	0.01	-1.20	0.50	0.02
Perceived importance of support duration	1.32	0.62	0.04	1.32	0.62	0.04	1.33	0.62	0.04	1.31	0.62	0.04
Investor's experience	0.50	0.28	0.08	0.50	0.28	0.08	0.50	0.28	0.08	0.50	0.28	0.08
Dummy Funds	-0.89	0.94	0.35	-0.89	0.94	0.35	-0.90	0.93	0.34	-0.95	0.92	0.31
Dummy VC	0.21	0.59	0.72	0.21	0.59	0.72	0.19	0.59	0.75	0.15	0.59	0.80
Dummy other investors	-0.42	0.58	0.48	-0.42	0.58	0.48	-0.44	0.58	0.46	-0.48	0.59	0.41
R <sup>2</sup>	0.35			0.35			0.35			0.27		
<i>Investment performance</i>												
RE share in the investment portfolio	0.05	0.02	0.04	0.08	0.06	0.16	0.06	0.02	0.02	0.09	0.06	0.12
Technological risk attitude	-0.12	0.03	0.00	-0.11	0.03	0.00	-0.12	0.03	0.00	-0.11	0.03	0.00
Investor's experience	0.01	0.10	0.89	-0.02	0.11	0.88	0.00	0.10	0.97	-0.03	0.11	0.81
Dummy Funds	-1.12	0.16	0.00	-1.09	0.17	<0.001	-1.11	0.16	<0.001	-1.08	0.17	<0.001
Dummy VC	-0.93	0.16	0.00	-0.95	0.16	<0.001	-0.94	0.16	<0.001	-0.96	0.16	<0.001
Dummy other investors	-0.86	0.13	0.00	-0.84	0.14	<0.001	-0.85	0.13	<0.001	-0.84	0.14	<0.001
R <sup>2</sup>	0.23			0.21			0.23			0.14		

The above table 2 shows the aftereffects of the multivariate relapses for the sustainable power source share demonstrate and the venture execution display (for purpose of effortlessness in the accompanying we allude to the OLS results as it were). The two models are critical ( $F_{44.14}$  with  $p_{0.01}$  and  $F_{43.83}$ ,  $p_{0.01}$ , individually) and have an adequate logical power ( $R^2_{40.35}$  and  $R^2_{40.23}$  separately). It tends to be noted from the table that from the earlier convictions impact the financial specialists' eagerness to back sustainable power source ventures.

Proficiency ( $b_{40.81}$  with  $p_{0.01}$  versus  $b_{40.34}$  with  $p_{40.18}$ ).

The investigation of the execution display uncovers that higher offer of

sustainable power source advancements in the speculation portfolio are related with a marginally higher act in respect to coordinate contenders ( $b_{40.05}$  with  $p_{40.04}$ ).

This gives proof against the tried-and-true way of thinking that interests in sustainable power source advancements yield lower returns contrasted with interests in regular vitality frameworks. It is additionally fascinating to take note of that the financial specialists' frame of mind towards innovative hazard has a solid negative effect on the speculation execution. This impact is both immediate and roundabout through its effect on the sustainable power source share in the venture portfolio. By and by, this fortifies the feeling that the reviewed speculators show repugnance for money related hazard, yet

additionally for innovative hazard. One conceivable clarification for this outcome is identified with the way that most of respondents in our example have rather constrained involvement in the sustainable power source area. Since financial specialists have not sufficiently gathered involvement in an industry that is promising, yet in addition hazardous, they may neglect to examine speculation openings in an appropriate manner, along these lines privileging transient returns as opposed to setting out in tasks that may ensure unrivaled returns over the long haul.

## DISCUSSION AND CONCLUSION

Sustainable power sources can possibly assume an essential job in lessening carbon outflows and petroleum derivative utilization in all segments of the economy. Be that as it may, enormous extra speculations are expected to understand this potential: the draft Copenhagen Climate Treaty issued by a few NGOs requires a multiplying of market ventures by 2012 and quadrupling by 2020 to achieve the proposed carbon outflow decrease targets (Meyer et al., 2009). Obviously, this is especially testing in a setting of worldwide financial log jam, for example, the one the world is at present encountering. Despite the fact that financial specialists can assume a key job in activating cash-flow to help sustainable power source innovations, proof proposes that they are regularly hesitant to do as such. Plainly, devoted arrangements can, and have been actualized to animate sustainable power source speculations. In any case, a large number of the endeavours directed so far have been just reasonably powerful on the grounds that, by neglecting to comprehend the conduct setting in which speculators decide, they were unfit to use a portion of the genuine drivers of the venture choice procedure.

Our investigation has exposed some intriguing discoveries. Specifically, it has uncovered that from the earlier convictions on the specialized viability of the speculation openings play a considerably more vital job than market convictions in driving ventures, certainly recommending that operators think about the demonstrated dependability of an innovation as a vital condition for putting resources into it, while they trust that showcase wasteful aspects can be remedied

through the selection of fitting strategy instruments. The outcomes have likewise uncovered a gathering of speculators with very short venture skylines, who have a solid inclination for transient strategies that give large amounts of monetary motivating forces for a constrained measure of time over long-haul arrangements that ensure a moderate however stable help for a more drawn-out time.

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