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How fast can businesses in the new energy sector grow? An analysis of critical factors

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ABSTRACT

For the new energy technology markets to grow, demand, prices, and business conditions need to be in balance. It is not just declining prices and increasing volumes that are important, but the business in the new energy sector also needs to be healthy, which is not always the case at present. We have analyzed the ability of businesses in the new energy sector to invest in new production capacity, which influences the total volume growth. Using the self-financeable growth rate (SGR) as an indicator, a declining trend was found among PV and wind power manufacturers. The prospects of initiating new investments through returns from operations are poor or negligible at present, which is explained by tougher competition, shrinking public support, and new entrants, among others. Reducing the cost of sales would be the most effective way to improve the growth prospects, though increasing revenues, e.g., through higher product prices, comes close to achieving the same result. Market measures such as consolidation, rationalization, better asset use, improving efficiency, etc. are equally important. The analysis results imply a growth limit of ca. 15–25% per year with present market conditions, which may also be a more permanent level, supported by findings from technology diffusion and growth model studies. The results suggest that it is not self-evident that the new energy technologies will meet the future goals set for these in the climate and energy policy strategies, unless policymakers and decision makers properly address the issue of restoring and securing sound business conditions.

1. Introduction

The progress of new energy technologies such as wind power and photovoltaics has been remarkable over the last decade [1]. The annual market growth of wind and PV has been measured in two-digit numbers and their price has fallen to close to a market breakeven point; in many places grid parity has actually already been reached [2]. Renewable energy (RE) is becoming a mainstream energy option in several countries: in Germany the goal is to produce 80% of all electricity by means of RE by 2050 [1,3]; within the same period all energy in Denmark should be derived from these sources [1,4]. The Scottish government aims at 100% renewable electricity by 2020, and the U.K. 30% by 2030 [1,5]. In recent global energy scenarios by the International Energy Agency (IEA) or the U.N. Intergovernmental Panel on Climate Change (IPCC), RE sources have reached a high share of energy and electricity production [6–10]. In our earlier work on the market growth of new technologies, assuming that if new energy technologies grew at the same pace as traditional energy did in the past, PV and wind could each reach up to a 25% share of all electricity by 2050 [11–13].

Strong volume growth, together with declining prices and shrinking public support for RE, puts extra pressure on the businesses in the new energy sector, as the profit margins fall and markets become more volatile. Bankruptcies are now more frequent and trade disputes are even arising between countries, for example in the PV sector, where competition has become severe [14,15].

Mainstreaming renewable energy for global energy production requires market growth, price development, and business conditions all to be in balance, which is clearly not the case today. The sustained market penetration of new energy technologies requires above all healthy business, not just declining prices and increasing volumes. This is also the prerequisite for reaching the ambitious national and global RE targets, which requires the scaling up of production capacities to a multiple of their present level. The scope of this paper is to investigate the growth conditions of businesses in the new energy sector; the factors that influence and limit the growth, aiming at gaining a better understanding of how the new energy sector could grow in the coming years and how to enhance this growth. The focus is on wind and PV technologies, which are

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Nomenclature

a	amortization or replacement rate
C	cost of sales
d	capital recovery factor
f	market share
I	investment
N	number of operating cash cycles per year
p	price
r	sales margin, profit
s	scale factor, $1
R	sales value, revenues
t	time
u	unit investment cost
V	capacity
$\alpha_{0,1}$	parameters in technology diffusion model
$\beta_{0,1,2}$	parameters in empirical growth model
φ	fixed asset term
λ	share of profit used for new investments
τ	duration of cash tied up in sales
τ_{occ}	operating cash cycle

Abbreviations

CAPEX	capital expenditure
EBIT	earnings before interest and tax
FiT	feed-in tariff
OCC	operating cash cycle
PV	photovoltaics
RE	renewable energy
SGR	self-financeable growth rate
Y2Y	year-to-year

the fastest-growing RE and power sectors today [1]. Another important goal is to identify sustainable growth rates for businesses in the sector, which could be valuable for policymakers when, e.g., deciding on support levels and RE targets. These aspects should also help achieve an understanding of what kind of growth levels may be realistic in the future. Cheap technology as such may not be an adequate goal in RE policy, but should also be linked with the profitability of the industries that need to be healthy.

The literature dealing with the market growth of new energy sources in general is ample, including models; see, for example Refs. [16,17]. Methodologically, such models may rely on describing technical, economic, or social factors, or any combination of these, that affect growth. For example, technology diffusion models [18,19] contain a strong socioeconomic and sociological dimension related to information spreading and decision making [20] and macro-economic energy system models [21,22] predict growth on the basis of optimal cost allocation and technical constraints [23], whereas business models deal with the growth of business. Market growth also has a strong linkage to the commercialization process of new technologies [24], energy planning [25], the green economy [26], market mechanisms [27–29], the resource base, system integration and policies [30–32] etc. In our approach, the market growth of new energy technologies is analyzed through the inherent ability of business to grow, which we describe through the self-financeable growth rate [33]. In this model, revenue generation and profit making are key drivers in creating growth and expanding the market.

The focus in this paper is on understanding the micro-level fundamentals of market growth, which is often overlooked for good reason in the macro-scale models. We recognize the abundance of business analyses dealing with company or branch performance in new energy [34], which is complementary rather than redundant and is used as an input for our analyses. Choosing the business as the main perspective for the market growth of new energy technologies is highly justified by the fact that the business dimension of new energy is often still more tangible than the energy impact: for example. the combined share of wind and PV of all electricity is less than 5% of all electricity [1,35], whereas their share of new electricity capacity added can be counted in tens of percents, in some countries being close to half [1,35], with a global market value of a few hundred billion dollars [1]. Considering the price and demand of RE, and associated financial support mechanisms, is equally important to market growth, but their profound analysis is beyond the scope of this paper, and will mainly be dealt with from a historical point of view. This may also be justified by the fact that the purpose of this paper is not the forecasting of future growth over time, but rather to understand the growth conditions and limitations of the new energy sector.

2. Growth

2.1. Market and price situation of new renewables

The capacity and price development of the new renewable sources, photovoltaic and wind power, has been very advantageous, and is illustrated in Fig. 1, which is used as base data for later analyses in this paper [see, e.g. Ref. [36]]. The global wind power market has grown by 21% per year on average since 1980 and

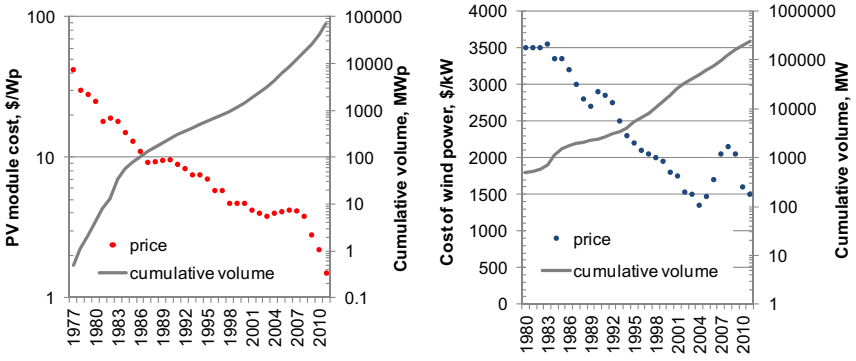

Fig. 1. Historical progress of PV and wind power. Costs and cumulative volumes shown.