TubeSolar AG

Germany / Renewable Energy
Düsseldorf
Bloomberg: 9TS
ISIN: DE000A2PXQD4

Initiation of coverage

RATING	**BUY**
PRICE TARGET	**€ 9.40**
Return Potential	42.4%
Risk Rating	High

INNOVATIVE AGRO-PHOTOVOLTAIC TECHNOLOGY

TubeSolar has developed an innovative latticed tube photovoltaic module, which, due to its special properties, is very well suited for the still young and rapidly growing agro-photovoltaic market. Agro-PV enables simultaneous agricultural and electricity production from the same piece of land. This increases land use efficiency by up to 70% and allows farms to generate income from both agricultural and electricity yields. Agro-PV offers an almost inexhaustible area and expansion potential for the generation of solar power due to the elimination of competition for space. Compared to classic flat modules, the advantages of the patented TubeSolar modules are their rain and light permeability, the resulting partial shading, and protection against heavy rain and hail. Partial shading protects the plants from excessive sunlight and dehydration, especially in sunny, dry regions. The relatively low module weight and the low wind load enable construction with cost-effective steel cable which should span areas of up to 50 ha. Certification of the TubeSolar modules is due to start at TÜV Rheinland by the end of October. This process should be completed in Q2/21. So far TubeSolar has set up a small semi-automatic pilot production. The construction of a highly automated 20 MW mass production facility (CAPEX: €20m) is planned for 2021 and is to be expanded in several steps to 250 MW by the end of 2024. The Free State of Bavaria is supporting the development with a 40% investment grant of up to €10.8m. The remaining funds to finance the 20 MW production line are to be raised through a capital increase and bank loans. We expect strong and profitable sales growth from 2022. Based on a DCF model our post-money valuation of the company is €9.40 per share. Our recommendation is Buy.

(p.t.o.)

COMPANY PROFILE

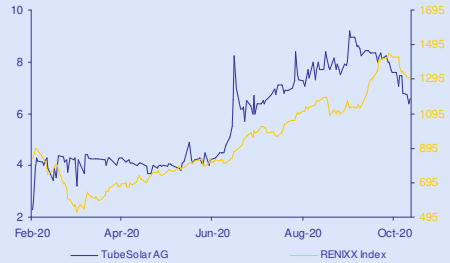
TubeSolar AG is a manufacturer of solar modules. The patented technology, which integrates solar cells into a glas tube, aims particularly at power generation on sites which are used for agriculture at the same time. TubeSolar is located in Augsburg, Germany.

MARKET DATA

As of 10/28/2020	
Closing Price	€ 6.60
Shares outstanding	10.00m
Market Capitalisation	€ 66.00m
52-week Range	€ 2.29 / 9.20
Avg. Volume (12 Months)	2,508

Multiples	2019	2020E	2021E
P/E	n.a.	n.a.	n.a.
EV/Sales	n.a.	n.a.	n.a.
EV/EBIT	n.a.	n.a.	n.a.
Div. Yield	0.0%	0.0%	0.0%

STOCK OVERVIEW



COMPANY DATA

As of 30 Jun 2020	
Liquid Assets	€ 2.06m
Current Assets	€ 2.25m
Intangible Assets	€ 9.56m
Total Assets	€ 12.61m
Current Liabilities	€ 3.03m
Shareholders' Equity	€ 9.41m

SHAREHOLDERS

TSG 1. Vermögensverw. GmbH	55.2%
BD Vermögensverw. GmbH	11.1%
Solar Invest International SE	9.7%
BF Holding GmbH	5.1%
Free Float	18.9%

FINANCIAL HISTORY & PROJECTIONS

	2018	2019	2020E	2021E	2022E	2023E
Revenue (€ m)	0.00	0.00	0.00	0.00	25.60	84.24
Y-o-y growth	n.a.	n.a.	n.a.	n.a.	n.a.	229.1%
EBIT (€ m)	0.00	-0.25	-2.66	-1.17	0.46	13.46
EBIT margin	n.a.	n.a.	n.a.	n.a.	1.8%	16.0%
Net income (€ m)	0.00	-0.25	-2.94	-1.10	-0.88	9.60
EPS (diluted) (€)	0.00	-0.03	-0.29	-0.09	-0.06	0.62
DPS (€)	0.00	0.00	0.00	0.00	0.00	0.00
FCF (€ m)	0.00	-0.25	-8.93	-21.24	-39.29	-24.92
Net gearing	0.0	-37.5%	-13.9%	28.3%	37.8%	72.6%
Liquid assets (€ m)	0.00	3.95	3.02	8.78	21.49	1.57

RISKS

The main risks are: technological risk, financing risk, product and production risks, and increasng competition.

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INVESTMENT CASE

INNOVATIVE PHOTOVOLTAIC TECHNOLOGY FOR AGROPHOTOVOLTAICS

TubeSolar's tube PV systems represent a new and unique solution for agrophotovoltaics (APV). APV is the simultaneous use of land for agricultural production and power generation, which can increase area productivity by up to 70%. Compared to flat modules, TubeSolar's lattice-like tube modules have several clear advantages for agrophotovoltaics. The main differentiating features are their light and water permeability, partial shading, low wind load and protection against heavy rain and hail. The low wind load lowers the structural requirements and enables the module to be mounted in a lightweight construction which significantly lowers the PV system costs. The light and water permeability of the modules enables plants to grow on the arable land under the module. Classic flat modules on the other hand are not permeable to water. Translucence is low or non-existent, meaning modules must be spaced at an adequate distance apart to allow sufficient light and rain to pass through. Accordingly, TubeSolar PV systems offer uniform protection from heavy weather while flat module systems only partially protect the plants. The uniform partial shading provided by the TubeSolar systems protects the plants in arid areas from excessive solar radiation and dehydration and makes the technology particularly attractive for APV in sunny, arid regions of the world. In view of the increasing extreme weather events caused by climate change, water scarcity, and soil degradation, we see TubeSolar's PV systems as a promising adaptation technology for agriculture.
The relatively low weight and the low wind load also make the TubeSolar technology attractive for rooftops, especially in connection with green roof concepts.

COST-EFFECTIVE MOUNTING SYSTEM IN LIGHTWEIGHT CONSTRUCTION

Thanks to the international cooperation with the renowned engineering company schlaich bergermann partner Sonne GmbH (sbp), TubeSolar will in future have an innovative mounting system that takes agricultural needs into account and uses the relatively low module weight and the low wind load of the modules for cost-effective lightweight construction. The mounting system will completely dispense with concrete foundations and massive steel girders to protect the ground. A steel cable construction that is easy to install at a height of four to ten metres is planned which can span over 50 hectares at once. In addition, the system should be able to withstand extreme winds and physical stress, and be able to be fully automatically cleaned. Software for determining light should guarantee optimal plant growth by precisely calculating the sun rays arriving on the ground. Compared to conventional mounting systems, the price per kW should be around 40% cheaper. We consider the overall concept of latticed tubular PV modules and steel cable construction for mounting to be almost ideal for the compatibility of agricultural and power production.

SUSTAINABLY DEFENDABLE COMPETITIVE ADVANTAGE THROUGH PATENT PROTECTION

TubeSolar's PV technology is patent protected. The principle of a tubular PV technology with a simple encapsulation of flexible PV strips in a glass tube was jointly developed and patented by Dr. Vesselinka Petrova-Koch and OSRAM GmbH. In 2011, Dr. Petrova-Koch, who has a degree in electrical engineering and a doctorate in semiconductor physics and materials science, invented a simple encapsulation of flexible PV strips in a glass tube at Gate-East in Garching. On advice of her husband, Prof. Frederik Koch, an American physicist who was professor at the Technical University of Munich from 1972 to 2005 and who established semiconductor physics in Munich and at this university, Dr. Vesselinka

Petrova-Koch proposed to OSRAM to jointly patent and implement the invention. This meant that the high-quality glass tube production at OSRAM in Augsburg was to be realigned and continued to be used. After the sale of the fluorescent tube plant in Augsburg to Ledvance, it was further developed by Ledvance GmbH. At the end of 2019 TubeSolar took over the patent, which was filed in Europe, Australia, China, India and the USA. It had already been granted in Australia, China and Europe.

SWOT ANALYSIS

STRENGTHS

- **Innovative technology for agrophotovoltaics** TubeSolars lattice-like tubular PV modules represent a new and unique solution for agrophotovoltaics (APV). Compared to classic flat modules, the main differentiating features are light and water permeability, partial shading, low wind load and protection against heavy rain and hail. The uniform partial shading protects the plants in arid areas from excessive solar radiation and dehydration and makes the technology particularly attractive for APV in sunny, arid regions of the world. We believe that the PV tube technology and the associated differentiation give TubeSolar a clear competitive advantage in the area of APV compared to alternative flat module concepts.

- **Patent protection offers sustainable competitive advantage** TubeSolar's PV technology is protected by an international patent. In Europe, Australia and China, the patent has already been granted. The patent has already been published in the USA but has not yet been granted. Patent protection offers TubeSolar a competitive advantage that can be defended over the long term.

- **Non-repayable investment grant from the Free State of Bavaria** The Bavarian state government is giving TubeSolar a non-repayable grant of 40% (up to a maximum of €10.8m) of the planned investment in a highly automated 20 MW production line. We see this as proof of the sustainability of the innovative PV technology and the product's great market opportunity.

- **Steel cable construction makes mounting inexpensive and easy** The steel cable construction, which is being developed in cooperation with the renowned engineering firm schlaich bergermann partner Sonne GmbH (sbp), is intended to span agricultural areas of up to 50 hectares at a height of four to ten metres. The elevation system will completely dispense with concrete foundations and massive steel girders to protect the ground. In addition, the system should be able to withstand extreme winds and physical stress. The inexpensive lightweight construction should lead to a reduction in the price per kW of approx. 40% compared to conventional mounting systems. TubeSolar will thus offer a PV solution that is very well adapted to agricultural production. Ideally, it produces inexpensive electricity and increases agricultural yields.

WEAKNESSES

- **Only a very short track record** TubeSolar was founded in 2019 and is a spin-off of OSRAM/Ledvance. So far, the company has incurred high business initiating expenses and development costs but no revenue has yet been generated. There is a risk that TubeSolar’s business model as a whole will prove to be unsustainable.

- **Certification of the modules is pending** TubeSolar’s PV modules are a completely new type of product that have yet to be certified and have therefore not yet reached marketability. The modules were submitted to TÜV Rheinland for

certification at the end of October. The certification process should take at least four to five months and will therefore probably take place in Q2/2021. Due to the novelty of the product, there is no long-term knowledge about the product quality (lifespan, performance, safety, reliability, compatibility with agricultural use). We consider certification to be necessary for successful commercial sales. There is a risk that the certification will take longer than expected or that it will fail due to technical defects.

- **Lack of financial support in Germany** So far, the German Renewable Energy Act (EEG) does not provide for general funding for photovoltaic systems on agricultural land. Since 2010, PV systems on arable land may only be installed in 110 m corridors along federal motorways and railways. The size of subsidised ground-mounted PV systems has been limited to 10 MW since the EEG 2012. However, a market for ground-mounted systems without subsidies on the basis of private-sector power purchase agreements (PPAs) is currently establishing itself in Germany. In addition, agricultural companies can use the PV electricity they produce themselves. This gives TubeSolar the opportunity to sell PV systems in Germany without EEG support mechnisms.

OPPORTUNITIES

- **Growth market agrophotovoltaics** APV is still a young PV sector. The cumulative global APV installations are likely to have been below 3 GW by the end of 2019. We are assuming very strong growth in this segment over the next few decades. In Germany alone, according to Fraunhofer ISE, the exploitable potential is around 60 GW. By comparison, at the end of 2019, all PV systems installed in Germany had a total capacity of 49 GW. The APV largely eliminates the competition for land between agricultural production and electricity production and thus opens up a virtually inexhaustible supply of space for PV. According to scientific estimates, less than 1% of the global agricultural area would theoretically be sufficient to meet the world's energy needs.

- **Green roof PV as a growth market** Global warming and traffic require concepts for cooling and improving local air quality, especially in cities. The cities are heat islands due to the high sealing, while traffic produces, among other things, particulates. One way of cooling and improving air quality is roof greening which binds CO_2 and filters particulates. Due to the TubeSolar module properties already mentioned, TubeSolar PV systems can be combined very well with roof greening.

- **More and more governments are supporting APV** There are more and more countries around the world that are supporting APV including Japan, South Korea, China, France and the state of Massachusetts in the United States. Given that agricultural land is becoming increasingly scarce worldwide due to soil degradation and population growth, as well as increasing demand for electricity, we assume that other countries will soon be launching financial support schemes for the APV market. Political discussions are already ongoing in many countries.

THREATS

- **Production risk** Aside from a semi automatic pilot production with low output, there is no established manufacturing process for the TubeSolar PV modules. It is not guaranteed that a frictionless and reliable mass production process can be established. For this purpose, production machines must be built and supplied by the appropriate manufacturers and the various production steps must be linked and coordinated. There is a risk that the development of highly automated mass production will not or only partially succeed, or be delayed.

- **Financing risk** The highly automated 20 MW production facility is scheduled to go into operation in the second half of 2021. The capital requirement for this is around €20m. This capital must be procured through equity and debt capital measures. The investment grant from the Free State of Bavaria mentioned above is helpful. There is also a project financing risk. The construction of TubeSolar PV systems is capital intensive and usually requires external financing. To do this, the system must be "bankable". Banks have traditionally been cautious about new products. Certification of the modules is an essential prerequisite for "bankability".

- **Agricultural risk** There are currently no long-term studies that have examined how various cultivated plants react to shading from the TubeSolar modules and how the microclimate under the modules changes. In the event that the plant growth in terms of quantity or quality is significantly worse than without the installation of the TubeSolar PV modules, the acceptance of the agricultural industry for the TubeSolar PV modules could be lacking.

- **Procurement risk** The production of necessary raw materials is in part limited to a few suppliers. There are default and price risks, due to low competition.

VALUATION

We calculate the fair value of TubeSolar on the basis of a DCF model which discounts free cash flows generated in the future to the present value (PV). Our three-phase model estimates phase 1 up to and including 2025E in detail. For phase 2 from 2026E to 2034E, free cash flows are determined based on assumptions about the most important model-relevant parameters (revenue, EBIT, depreciation, CAPEX, working capital). The third phase calculates the terminal value.

We use the Weighted Average Cost of Capital (WACC) concept to calculate the discount rate. This determines the discount rate by the weighted average of the cost of equity and debt. We calculate the cost of equity using the capital asset pricing model, the risk-free interest rate and the market risk premium multiplied by the company-specific risk factor.
We assume 0.1% as the risk-free interest rate. This estimate is based on long-term returns on government bonds that are considered safe. The 10-year German government bond is currently yielding around -0.6%, and 10-year US government bonds are currently yielding 0.8%. We note that the very expansionary monetary policy of the central banks, which also includes the purchase of government bonds on the market, contributes strongly to lowering their yields.
We consider the company-specific risk factor in a proprietary model which includes parameters such as earnings quality, management strength, financial risk, competitive position, corporate governance, transparency in the publication of financial figures, company size and regulatory security. We calculated a value of 2.9 for TubeSolar.
As market risk premium, we assume a value of 5.0% determined in scientific empirical studies. This results in a cost of equity rate of 0.1% + 2.9 * 5.0% = 14.6%.
We assume a debt interest rate of 5% for the cost of debt. With an assumed tax rate of 30%, this results in an after-tax debt interest of 3.5%. We assume a long-term target capital structure of 85% equity and 15% debt. This weighting results in a WACC of 12.9% which we use as the discount rate.

The assumptions for the first phase (2020E-2025E) are explained in detail in the chapter "Financial history and outlook". For the second phase (2026E-2034E) we make the following assumptions:

- Revenue growth will decrease from 15.1% in 2026E to 2% in 2034E.
- The EBIT margin declines from 22.5% to 14.2%. Increasing competition is the main reason for the decline in margins.
- The tax rate is 30% throughout.

The third phase calculates the terminal value. This is based on the following assumptions:

- Sales growth is 2%.
- The terminal EBIT margin is 14.2%.
- The terminal tax rate is 30%.

The following figure shows the determination of the fair value of the TubeSolar share.

VALUATION MODEL

DCF valuation model All figures in EUR '000	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E
Net sales	**0**	**0**	**25,600**	**84,240**	**140,000**	**167,500**	**192,777**	**218,715**
NOPLAT	**-2,925**	**-1,166**	**458**	**11,771**	**24,166**	**28,021**	**30,863**	**34,481**
+ depreciation & amortisation	1,192	2,910	6,492	10,495	13,420	15,304	16,125	14,742
Net operating cash flow	-1,733	1,744	6,950	22,266	37,586	43,325	46,987	49,223
- total investments (CAPEX and WC)	-7,180	-23,055	-44,909	-45,015	-29,809	-11,803	-12,810	-13,993
Capital expenditures	-6,880	-22,190	-44,256	-40,421	-24,662	-8,360	-9,131	-9,802
Working capital	-300	-865	-653	-4,593	-5,147	-3,443	-3,679	-4,191
Free cash flows (FCF)	-8,913	-21,311	-37,960	-22,749	7,776	31,523	34,177	35,230
PV of FCF's	**-8,727**	**-18,475**	**-29,139**	**-15,462**	**4,679**	**16,794**	**16,122**	**14,715**

All figures in thousands	
PV of FCFs in explicit period (2020E-2034E)	45,097
PV of FCFs in terminal period	50,612
Enterprise value (EV)	95,709
+ Net cash / - net debt (pro forma)	42,079
+ Investments / minority interests	0
Shareholder value	137,788
Diluted number of shares	14,603
Fair value per share in EUR	9.40

WACC	12.9%
Cost of equity	14.6%
Pre-tax cost of debt	5.0%
Tax rate	30.0%
After-tax cost of debt	3.5%
Share of equity capital	85.0%
Share of debt capital	15.0%
Price target	9.40

WACC \ Terminal growth rate	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%
8.9%	16.67	16.96	17.29	17.67	18.11	18.62	19.23
9.9%	14.18	14.36	14.57	14.80	15.07	15.37	15.72
10.9%	12.19	12.31	12.45	12.59	12.76	12.95	13.16
11.9%	10.59	10.67	10.75	10.85	10.95	11.07	11.20
12.9%	9.27	9.32	9.37	9.44	9.50	9.57	9.66
13.9%	8.17	8.20	8.24	8.28	8.32	8.36	8.41
14.9%	7.24	7.26	7.28	7.31	7.34	7.36	7.40
15.9%	6.45	6.46	6.48	6.49	6.51	6.53	6.55

* for layout purposes the model shows numbers only to 2027, but runs until 2034

The present value of free cash flows for the explicit period (phase 1 and 2) is €45.1m. The present value of the free cash flows in the terminal period (terminal value) is €50.6m. The share of the terminal value in the enterprise value is 53%. The sum of the values from both periods results in an enterprise value of €95.7m.

To determine shareholder value, the net debt must be deducted or the net cash position (end of 2019: € 4.0m) must be added respectively. The funds from the capital increases modelled by us (2020: €7.0m, 2021: €12.0m, 2022: €27.0m) are added to this. The capital increases in 2021 and 2022 have been discounted to the present value. This results in a pro forma net cash position of €42.1m and a fair shareholder value of €137.8m. The present value of the number of shares in the capital increases modelled by us (a total of 5.5m new shares) is 4.6m. This results in a diluted number of shares of 14.6m. Based on our DCF model, the fair value per share is thus €9.44.

COMPANY PROFILE

TubeSolar AG is a manufacturer of innovative solar modules. The patented technology, in which thin-film solar cells are integrated into a glass tube, is aimed in particular at generating electricity on areas that are also used for agriculture (so-called agrophotovoltaics (APV)). The technology is also suitable for roofs. TubeSolar is based in Augsburg, Germany. A mass production facility is planned there that should reach a capacity of 20 MW in 2021 and 250 MW by the end of 2024. The TubeSolar AG share has been trading on the general open market in Düsseldorf since February 2020. A total of 10m no-par value shares are included for trading. Accounting is based on German GAAP (HGB). TubeSolar currently has around 40 employees.

CORPORATE HISTORY

TubeSolar AG was founded on 25 November 2019. All shares in TubeSolar GmbH, Augsburg, with a value of €6m were brought in by contribution in kind. TubeSolar GmbH is a spin-off from Ledvance, formerly OSRAM. In 2019 TubeSolar GmbH took over part of the original OSRAM fluorescent tube production in Augsburg, including patents, and has been using this patented technology since then to develop photovoltaic thin-film tubes that are assembled into modules. As a first step, at the beginning of April 2020, 11 former Ledvance/OSRAM employees were hired in addition to the 13 employees taken over from Ledvance. In September 2020, TubeSolar GmbH merged with the AG with retroactive effect from 1 January 2020.
In August, TubeSolar announced a worldwide cooperation with the international engineering company schlaich bergermann partner (sbp) Sonne GmbH for the development of an innovative mounting for the TubeSolar modules.
On 16 September 2020, TubeSolar received the funding decision from the Bavarian Ministry of Economic Affairs that supports the company with a non-repayable investment grant of up to €10.8m. The state finances 40% of the total eligible costs.
At the beginning of October, TubeSolar announced that it was planning a cash capital increase for the end of 2020 or beginning of 2021, the details and framework conditions of which are subject to a separate resolution.

PATENTED PHOTOVOLTAIC TECHNOLOGY

TubeSolar`s PV technology is patent protected. The principle of tubular PV technology with a simple encapsulation of flexible PV strips in a glass tube was invented in 2011 by Dr. Vesselinka Petrova-Koch, graduated electrical engineer and doctorate in semiconductor physics and materials scientist, at Gate-East in Garching. The PV modules were jointly developed and patented by Dr. Petrova-Koch and OSRAM GmbH. After the sale of the fluorescent tube plant in Augsburg to Ledvance, it was further developed by Ledvance GmbH. At the end of 2019 TubeSolar GmbH took over the property, plant and equipment, and the patent.
The patent acquired by TubeSolar AG is registered in Europe, Australia, China, India and the USA and has so far been granted in Europe, Australia and China (see figure 1 overleaf). The European Patent Office (EP) informed TubeSolar in September 2020 that it wants to grant the patent. The EP patent application number is 15 808 241.2 and is based on PCT application number PCT/EP2015/079475. The patent was applied for on 11 December 2015 and published on June 16, 2016 under the publication number WO/2016/092090 and the title "Photovoltaic module and photovoltaic system".

Figure 1: National patent status

Patent Office	Date of receipt	National number	National status
Australia	06/06/2017	2015359270	publ. 06/29/2017, granted 10/11/2018
China	06/09/2017	201580067217.7	granted 06/14/2019
USA	06/12/2017	15535370	published 11/16/2017

Source:
https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016092090&tab=NATIONALPHASE

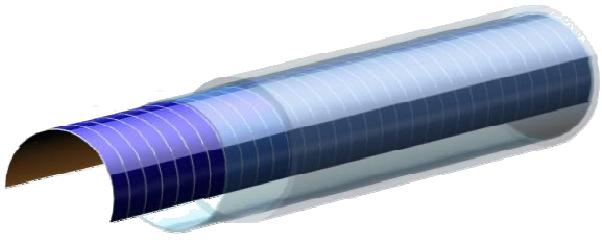
PODUCTION PROCESS

There is currently a pilot production, which we have personally inspected, with a capacity of approx. two kWp per week. This semi-automatic production process is currently in a continuous improvement process and serves as the basis for the planned automated mass production with a capacity of 20 MWp and a planned 2021 launch.
In a first production step, the PV thin-film film is cut into strips, then enclosed in a film (encapsulant) and equipped with a power connection at the ends of the strips. The thin film is inserted into the glass tube and laminated to the inside of the glass tube via the encapsulant. The tube is evacuated, an inert gas is applied and the ends are fused, so that the tube inside is protected from environmental impact. The application of protective gas leads to the extraction of moisture in the glass tube that is sealed to the outside. TubeSolar currently uses nitrogen for this. Approx. 20 tubes are electrically connected at their ends and combined in a latticed manner using hotmelt potting. Two such half-modules are attached to a rail and form a PV module.

PRODUCT

The glass tube is approx. 1 m long and has a diameter of approx. 2.5 cm. It largely corresponds to a glass tube from fluorescent tube production but is a little thicker. It must not contain any predetermined breaking points in order to be robust and especially hail-resistant. The thin PV film integrated in a glass tube (see figure 2) has an output of approx. 5 W, and the efficiency of the PV cells tops 10%.

Figure 2: TubeSolar glass tube with thin film



Source: First Berlin Equity Research, TubeSolar AG

A half module consists of 20 tubes which are combined in a lattice-like manner and are roughly 2.5 cm apart. The nearly 1 m * 1 m large half-modules are combined with a rail to form the TubeSolar module (see figure 3) which then has a width of approximately 1 m, a length of approximately 2 m, and a weight of approximately 18 kg. According to first estimates, the module performance is approximately 120 Wp.

Figure 3: TubeSolar PV module

Source: First Berlin Equity Research, TubeSolar AG

The latticed composition means that light comes through between the tubes. There are still no certified values for light transmission. The grid-like arrangement in which the tubes, which have a diameter of 2.5 cm, are 2.5 cm apart, suggests that the light transmission is around 40-50%.

ADVANTAGES OF THE TUBESOLAR PV SYSTEM

The specific properties of the TubeSolar PV system make it possible to use it in agriculture. The agricultural area continues to serve primarily for agricultural production, but is simultaneously used to generate electricity. Conventional PV open-space systems, on the other hand, do not allow any agricultural use and are therefore in competition for land.
Due to the lower wind load compared to flat modules, TubeSolar modules can also be used to generate electricity on many previously unused roofs, especially in connection with green roofs. This means that the potential of rooftop photovoltaics can be better exploited.
Compared to traditional flat modules, the innovative TubeSolar tube modules have a number of advantages that make them particularly suitable for agrophotovoltaics (see figure 4 on the next page).

- The spaces between the PV tubes make the TubeSolar modules permeable to light and water. This predestines them for APV.
- The wind and snow permeability reduces the load-bearing capacity and enables inexpensive mounting in lightweight construction.
- Partial shading protects the plants in dry regions from solar radiation and reduces water requirements.
- The round surface allows for significantly better self-cleaning than flat modules.

- The tube modules are mounted horizontally. This is easier and cheaper than the mounting of flat modules, which usually takes place at a 30-45 degree angle. Thanks to the radial module surface, the TubeSolar modules have a favourable angle to the sun for most of the day, even when mounted horizontally. The radial module surface also explains the relatively even yield over the course of the day.
- The tube modules offer plants protection from heavy rain and hail. If, on the other hand, flat modules are used for APV, the distances between the modules are so large that they do not offer the areas underneath any effective protection against heavy rain and hail.

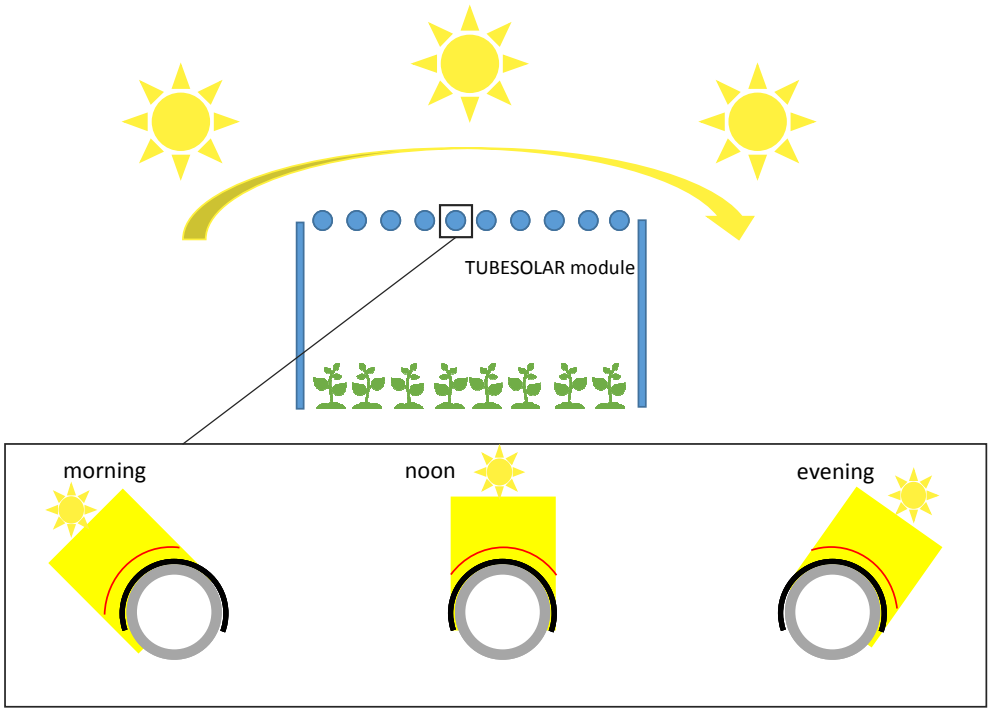
Figure 4: Advantages of TubeSolar modules compared to traditional flat modules

	TubeSolar module	Flat module
Light and water permeability for optimal plant growth	√	x
Wind and snow permeability reduce load	√	x
Lightweight construction for simple and cost-effective mounting	√	x
Partial shading reduces water requirement in arid regions and protect plants from solar irradiation	√	x
Self-cleaning of modules thanks to round surface	√	x
Relatively even output during the day due to radial module surface	√	x
Easy and quick construction due to horizontal PV mounting	√	x
Protection of plants against heavy rain and hail	√	x

Source: First Berlin Equity Research, TubeSolar AG

The above-mentioned steady module yield in the daily routine is clear from figure 5. Due to the round surface of the modules, the sun irradiates almost the same PV area all day.

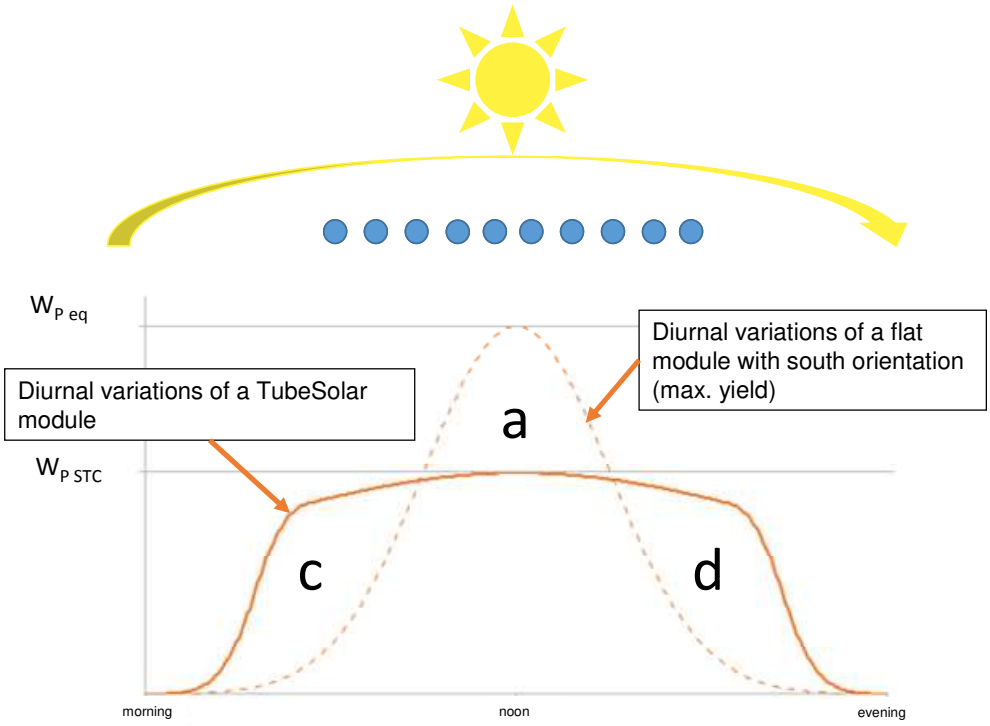
Figure 5: More even yield thanks to the radial module surface



Source: First Berlin Equity Research, TubeSolar AG

A stylised comparison of the electricity yield curves of a TubeSolar module and a flat module (see figure 6 on the next page) shows that this means the TubeSolar module does not generate as high yields at noon as an equivalent flat module with a south orientation (area a, figure 6), but produces significantly more electricity in the morning and in the evening (areas c and d). To illustrate the additional yield through the PV geometry, an equivalent watt peak value (Wp eq) was defined:
With the same nominal output, the total yield of the TubeSolar module should be approx. 1.5 times higher than with a conventional flat module of the same size. Under standard test conditions (1000 W/m^2, defined spectrum, 25 °C. cell temperature), a TubeSolar module with a nominal output of 120 Wp should, according to first estimates, therefore achieve the same power production as a flat module with ca. 180 Wp.

Figure 6: Stylised comparison of the yield curves of a TubeSolar and a flat module



Wp eq = equivalent watt peak value, Wp STC = watt peak value under standard test conditions

Source: First Berlin Equity Research, TubeSolar AG

Today's monocrystalline flat modules from renowned manufacturers such as JA Solar, Trina Solar, LG or Solarwatt mostly have an output in a range of approx. 280-320 Wp. With a width of approx. 1.0 m and a length of approx. 1.7 m, they are slightly smaller than the TubeSolar modules. Even if a direct comparison of the power yield of the TubeSolar module with that of flat modules is not easily possible due to the different size and module properties, we estimate that the power yield of the TubeSolar module is more than 30% below the yield of monocrystalline flat modules. In terms of the performance of the area spanned by the modules, TubeSolar PV systems are already superior to flat module designs. We assume that TubeSolar PV systems will have an output of approx. 0.6 MWp per hectare. According to the scientific literature, only approx. 0.3 - 0.5 MWp output per hectare is calculated for flat modules due to the necessary spacing between the modules in agrophotovoltaic systems. If it is taken into account that the TubeSolar modules are likely to have about 1.5 times the electricity yield per MW compared to flat modules with a similar output, the electricity production per hectare should be almost twice as high.

INNOVATIVE MOUNTING SYSTEM

Thanks to the international cooperation with the renowned engineering company schlaich bergermann partner sonne GmbH (sbp), TubeSolar will have an innovative mounting system in the future that takes agricultural issues into account and uses the low module weight and the low load-bearing capacity of the modules for a cost-effective lightweight construction. TubeSolar designs the mounting system together with sbp and is involved in every project implemented through a license distribution. The holistic system solution is offered to project developers and solar installers. TubeSolar only supplies the modules and sbp provides the engineering and, if necessary, approval assistance and, in some cases, EPCM (engineering, procurement and construction management) services. sbp has a lot of engineers and thus

sufficient capacity to implement 250 MW p.a, as the company's service process is always the same. sbp's international presence and its own global supply chain management and supplier network for mounting and assembly enable project implementation on an international level.

sbp has decades of experience in components and systems for concentrating solar systems and various types of PV systems including trackers and building-integrated PV. In particular, the company has expertise and a reputation for wide surges. The mounting system will completely dispense with concrete foundations and massive steel girders to protect the ground. A steel cable construction that is easy to install at a height of four to ten meters is planned, which can span up to 50 hectares in one piece. In addition, the system should be able to withstand extreme winds and physical stress and will feature automatic cleaning. Software for determining light should guarantee optimal plant growth by precisely calculating the sun rays arriving on the ground. sbp wants to present the first results by the end of 2020.

Figure 7: Planned appearance of a TubeSolar PV system

Source: First Berlin Equity Research, TubeSolar AG

IMPORTANT SUPPLIERS

The flexible thin film is supplied by a European thin film manufacturer and is based on CIGS technology (copper-indium-gallium-diselenide). The manufacturer has developed its patented technology over ten years and built a 15 MW production line. Further expansion steps are planned. In principle, other flexible thin-film films are also suitable for the TubeSolar modules. Foil from a southern German foil manufacturer is used to encapsulate the PV thin film. The supplier for the glass, plate and pump pipes is a large European producer. Other inputs such as stainless steel foil, welding wires, glue, potting compound, side rails, cables and connectors can be procured from various manufacturers.

SALES STRATEGY

TubeSolar plans to build pilot systems with a capacity of 10-100 kW for selected customers from the horti- and agricultural sectors in the next few months. The possible additional agricultural yield below the pilot plants belongs to the customer, and crop yields are documented by scientific institutes. With further production of the tube modules, larger pilot plants with cost-efficient mounting technology will be set up. The aim of these first steps is to generate an order backlog for production within this already qualified group of customers, who should then immediately utilise the highly automated first production line. For further sales, the company plans to cooperate with solar installers and project planners in the agricultural sector in Germany, southern Europe and the USA. In the final stage, a tailor-made system concept for agricultural businesses (size as required up to 20 MW or 20 hectares) is to be created, which can be built or enlarged in a modular manner. Qualified partner companies carry out installation, construction and operation of such systems in Germany or on site. Ultimately, the independent implementation of projects with requirements that are optimally suited to the TubeSolar system is planned, especially in agro-PV, but also in partnerships for smart / green city, car port, and industrial roof applications.

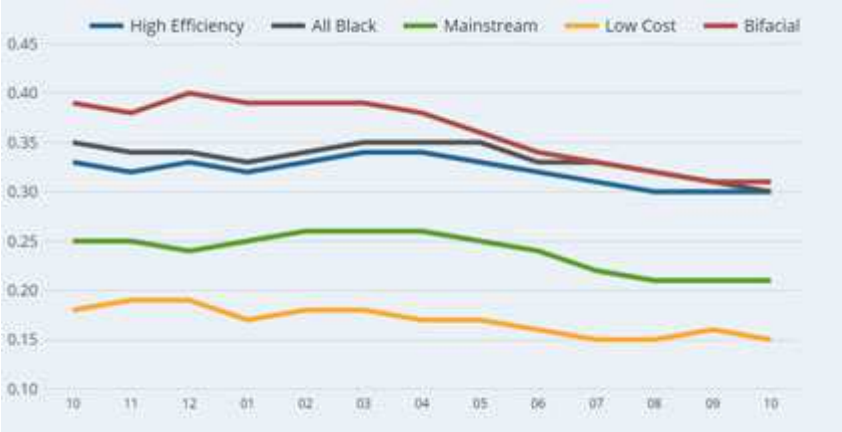
PROJECT PIPELINE

TubeSolar is already working on a project pipeline. This includes planned APV projects in Hawaii, in Brandenburg and Bavaria, and a rooftop project.
A Hawaiian-based agricultural company is negotiating with TubeSolar to install a 1 MW system that will span ca. 1 hectare of agricultural land. The electricity yield is used by the agricultural company itself. If successful, systems for a further 10 MW are to be built.
In Brandenburg, negotiations are taking place with a property management company on the lease of an approx. 3 hectare agricultural area which is available for mounting a TubeSolar PV system.
In the Bavarian town of Weihenstephan, in cooperation with the Weihenstephan-Triesdorf University of Applied Sciences, a 30m x 30m test facility (approx. 100 kW) is to be installed in order to examine the optimal plant growth of different crops and to study the solar radiation arriving at the ground.
TubeSolar is planning a demonstration system on the roof of a global green roof system manufacturer. The aim is to develop joint solutions for rooftop solar systems and a sales cooperation.

PRICE COMPARISON TUBESOLAR PV SYSTEM VERSUS PV SYSTEM WITH BIFACIAL AND HIGH-EFFICIENCY MODULES

In the case of flat modules, we consider bifacial modules to be most suitable for agro-photovoltaics, as they use a transparent film or glass as rear side material so that the rear side is also photovoltaically active. In this way, light that penetrates the module and the reflected light from the surroundings of the rear can be used to generate electricity. Factors such as the albedo (reflectivity) and the distance between the module and the subsurface determine how high the additional yield on the rear side is. In general, the higher the albedo and the larger the distance between the module and the surface, the higher the additional yield. Especially in the mornings and evenings when the sun is very flat, the back can make the biggest contribution. Thus, bifacial modules are most suitable for a price comparison with the TubeSolar modules. According to the solar wholesale photovoltaic shop pvXchange.com, the price of bifacial modules is currently around € 0.31/Wp (see figure 8 on the next page).

Figure 8: Price development of various types of modules in €/Wp 11/2019 - 10/2020



Source: First Berlin Equity Research, pvXchange.com

The price comparison of bifacial modules with TubeSolar modules shows that the latter will be considerably more expensive according to TubeSolar's current planning. For a production of 20 MW we assume a price of €0.80/Wp, for a production of 250 MW a price of € 0.67/Wp. For the user, however, it is not the module costs but the system costs that are decisive. The lower installation costs resulting from the special TubeSolar module properties (lower wind and snow load, relatively low weight) largely compensate for the module price difference (see figure 9).

Figure 9: Price comparison bifacial system versus TubeSolar system

	Crystalline bifacial system (€/Wp)	TubeSolar system production 20 MW (€/Wp)	TubeSolar system production 250 MW (€/Wp)
Modules	0.31	0.80	0.67
Mounting system	0.50	0.30	0.30
Inverter	0.06	0.06	0.06
Electr. components	0.12	0.12	0.12
Total price	**0.99**	**1.28**	**1.15**

Source: First Berlin Equity Research, TubeSolar AG

With a TubeSolar module production of 20 MW, the TubeSolar system is approx. 29% more expensive than today's bifacial APV systems, with a module production of 250 MW it is approx. 16%.
We would like to point out that the costs per watt are only an inadequate benchmark, as the amount of electricity produced is not taken into account. A better benchmark is the levelised cost of electricity (LCoE), which calculates total costs (CAPEX and OPEX) over the lifetime of the PV system per kWh. No calculations are yet available for TubeSolar modules. We assume that the relatively higher yield per watt of the TubeSolar modules causes the LCoE to decrease compared to flat modules.
For the farmer, the better compatibility of the TubeSolar system with agricultural production compared to the flat module system is also included in the price calculation. We therefore assume that agro-photovoltaics with the TubeSolar system lead to similarly high or even higher yields in many plants. Therefore, the particular suitability of TubeSolar systems for agro-photovoltaics should lead to a greater willingness to pay by many farmers.
In addition, some federal states give investment grants for innovative concepts such as the TubeSolar system. There are also federal and EU programs. For many farmers, consuming the electricity they generate themselves should be significantly cheaper than purchasing electricity from the grid.

FINANCIAL HISTORY AND OUTLOOK

FINANCIAL SITUATION

Since TubeSolar AG was only founded in November 2019 the 2019 annual financial statements are not meaningful. The net loss for the year was €254k. The largest single item in the income statement was personnel expenses at €297k.
The balance sheet total was €11.0m. The two main items on the assets side were shares in affiliated companies (€6.85m) and cash and cash equivalents of €3.95m. The shares in affiliated companies reflect the value of the 100% stake in TubeSolar GmbH which was merged with the AG in September 2020. On the liabilities side, equity is by far the largest item at €10.5m. The second largest item is other liabilities at €0.3m. The 2019 annual report does not contain a cash flow statement.
The 2020 half-year report shows a net result of €-1.5m. Personnel expenses were €0.8m, depreciation and other operating expenses each amounted to €0.6m. The half-year balance sheet totalled €12.6m. The most important item on the assets side is intangible assets at €9.6m. Liquid funds were €2.1m. On the liabilities side, equity was the largest item at €9.4m. Deferred tax liabilities amounted to €2.9m.

FINANCIAL OUTLOOK

Profit and Loss Account

The financial outlook is based on TubeSolar's and our own estimates. We assume that TubeSolar will set up and initiate the first 20 MW production line in 2021 but believe that first sales will start from 2022. The commissioning of additional production lines will expand production and sales significantly in the following years. We assume that TubeSolar will reach the targeted capacity of 250 MWp by the end of 2024 and that production volume will be 250 MW in 2025. With regard to the average sales price per MWp, we forecast that this will gradually decrease from €800k/MWp in 2022 to €670k/MWp in 2025 due to increasing competition. This results in sales of €25.6m for 2022 and a strong rise in sales in the following years to €167.5m in 2025 (see figure 10).

Figure 10: Sales development 2020E-2025E

	2020E	2021E	2022E	2023E	2024E	2025E
Sales in MWp	0	0	32	108	200	250
Price (€k/MWp)	./.	./.	800	780	700	670
Sales (€k)	0	0	25,600	84,240	140,000	167,500

Source: First Berlin Equity Research, TubeSolar AG

We assume a decreasing net loss for 2020 to 2022 and increasing net profits from 2023. The years 2020 and 2021 are characterised by costs for setting up the company and the first 20 MW production line. Own work capitalised (2020: €3.7m, 2021: €4.5m) and other operating income (2021: €6.0m from government grants) limit the losses. In the year 2022E, the first turnover (€25.6m) leads to a gross profit of €12.8m and EBITDA of almost €7.0m. Depreciation and amortisation result in slightly positive EBIT of €0.5m, interest payments on bank loans result in a negative EBT of €1.3m.
From 2023E onwards, the strong rise in sales will lead to large increases in gross profit (see figure 11 overleaf). We assume that the gross profit will soar from €42.1m in 2023 to €77.0m in 2025. The high gross profit margins (46% - 50%) are a result of the high module prices, which TubeSolar should be able to demand due to its patented and so far unique technology, as well as lower costs per MW with increasing economies of scale and experience.

From 2023E - 2025E we assume a rise in EBIT from €13.5m to €39.1m. The EBIT margin will widen from 16.0% to 23.3%. Economies of scale are the reason for the margin increase. The net result climbs from €9.6m in 2023E to €26.1m in 2025E (see figure 11).

Figure 11: Sales and earnings development 2019A - 2025E

in €m	2019A	2020E	2021E	2022E	2023E	2024E	2025E
Sales	0.0	0.0	0.0	25.6	84.2	140.0	167.5
Growth	*./.*	*./.*	*./.*	*./.*	*229.1%*	*66.2%*	*19.6%*
Gross profit	0.0	-2.0	-2.5	12.8	42.1	67.5	77.7
Margin	*./.*	*./.*	*./.*	*50.0%*	*50.0%*	*48.2%*	*46.4%*
EBITDA	-0.3	-1.5	1.7	6.9	24.0	47.0	54.4
Margin	*./.*	*./.*	*./.*	*27.1%*	*28.4%*	*33.5%*	*32.5%*
EBIT	-0.3	-2.7	-1.2	0.5	13.5	33.5	39.1
Margin	*./.*	*./.*	*./.*	*1.8%*	*16.0%*	*24.0%*	*23.3%*
EBT	-0.3	-2.7	-1.6	-1.3	11.3	31.2	36.8
Margin	*./.*	*./.*	*./.*	*-4.9%*	*13.4%*	*22.3%*	*22.0%*
Net result	-0.3	-2.9	-1.1	-0.9	9.6	21.9	25.7
Margin	*./.*	*./.*	*./.*	*-3.4%*	*11.4%*	*15.6%*	*15.4%*
EPS (diluted, in €)	-0.03	-0.29	-0.09	-0.06	0.62	1.41	1.66

Source: First Berlin Equity Research

Balance sheet

On the assets side, the balance sheet is characterised in particular by rising property, plant and equipment. The steady increase in production capacity to 250 MWp by the end of 2024 increases the value of property, plant and equipment from €6.7m at the end of 2020E to €109.5m at the end of 2024. The increase in sales will lead to a higher working capital requirement from 2022 (see inventories and trade receivables in figure 12).

Figure 12: Development of selected balance sheet items, 2019A - 2025E

in €m	2019A	2020E	2021E	2022E	2023E	2024E	2025E
Intangible goods & Goodwill	0.0	7.4	6.3	5.5	4.8	4.3	4.0
Property, plant & equipment	0.0	6.7	28.5	67.1	97.7	109.5	102.9
Financial assets	6.8	0.0	0.0	0.0	0.0	0.0	0.0
Non-current assets, total	**7.1**	**14.4**	**35.1**	**72.8**	**102.7**	**114.0**	**107.0**
Inventories	0.0	0.1	1.0	1.1	3.5	6.5	8.7
Receivables	0.0	0.2	0.2	2.1	6.9	11.9	14.6
Cash and cash equivalents	4.0	3.0	8.8	21.5	1.6	7.0	35.3
Current assets, total	**4.0**	**3.3**	**10.0**	**24.6**	**12.0**	**25.4**	**58.6**
Equity	10.5	14.6	25.5	51.6	61.2	83.1	108.8
Equity ratio	*95.7%*	*82.6%*	*56.6%*	*53.0%*	*53.4%*	*59.6%*	*65.7%*
Financial debt (long-term)	0.0	1.0	16.0	41.0	46.0	45.0	30.0
Financial debt (short-term)	0.0	0.0	0.0	0.0	0.0	1.0	15.0
Net debt	-4.0	-2.0	7.2	19.5	44.4	39.0	9.7
Net Gearing	*-37.5%*	*-13.9%*	*28.3%*	*37.8%*	*72.6%*	*46.9%*	*8.9%*
Payables	0.1	0.1	0.1	1.4	4.0	6.9	8.4
Balance sheet total	**11.0**	**17.7**	**45.0**	**97.5**	**114.7**	**139.4**	**165.7**

Source: First Berlin Equity Research

On the liabilities side, three capital increases lead to an increase in equity to €51.6m by the end of 2022E. From 2023E, the increase in equity is due to the annual net profits. Investments are to be financed partly through bank loans. Accordingly, financial liabilities will rise from €1.0m at the end of 2020E to €46m at the end of 2023E.

Cash flow statement

For 2020E we assume that an equity increase of €7.0m and a bank loan of €1.0m will be successfully completed (see figure 13). The funds will be used for initial investments in the 20 MW production line (CAPEX 2020E: €6.9m).

Despite the net loss of €1.1m in 2021E, operating cash flow is slightly positive at €0.9m due to depreciation (€2.9m). Investments in the first and second production lines lead to a cash outflow from investing activities of €22.2m. The investments are financed by an equity increase (+€12.0m) and by taking on bank loans (+€15.0m).

For the year 2022E we assume an operating cash flow of €5.0m (depreciation and amortisation: €6.5m). Investments in three additional production lines (FBe: €44.3m) are financed by additional equity (+€27.0m) and bank loans (+€25m).

Figure 13: Statement of cash flows, selected items, 2019A - 2025E

in €m	2019A	2020E	2021E	2022E	2023E	2024E	2025E
Operating cash flow	**-0.3**	**-2.0**	**0.9**	**5.0**	**15.5**	**30.1**	**37.6**
CAPEX	0.0	-6.9	-22.2	-44.3	-40.4	-24.7	-8.4
Free cash flow	-0.3	-8.9	-21.2	-39.3	-24.9	5.5	29.2
Cash flow investing	**0.0**	**-6.9**	**-22.2**	**-44.3**	**-40.4**	**-24.7**	**-8.4**
Equity increase	0.0	7.0	12.0	27.0	0.0	0.0	0.0
Change in debt, net	0.0	1.0	15.0	25.0	5.0	0.0	-1.0
Cash flow financing	**0.0**	**8.0**	**27.0**	**52.0**	**5.0**	**0.0**	**-1.0**
Net cash flow	**-0.3**	**-0.9**	**5.8**	**12.7**	**-19.9**	**5.5**	**28.2**

Source: First Berlin Equity Research

In 2023E operating cash flow will reach €15.5m. CAPEX in five additional lines (€40.4m) will be financed from existing and generated funds as well as debt of €5.0m. The funds for the capacity expansion to 250 MWp in 2024E will come from operating cash flow. We note that some of the investments in the new lines are spread over two calendar years. We refer to figure 14 for a better overview of the time schedule we have assumed for the capacity build-up.

Figure 14: Model of capacity building 2020-2024

Number of production lines	Capacity MWp	CAPEX (€m)	Time frame
Line 1	20	20	2020-21
Line 2	20	17	2021-22
Line 3	20	15	2022
Line 4	20	12	2022
Line 5	20	10	2022-23
Line 6	20	10	2023
Line 7	21	10	2023
Line 8	21	9	2023
Line 9	22	9	2023-24
Line 10	22	9	2023-24
Line 11	22	8	2024
Line 12	22	8	2024
12 Lines	**250**	**137**	**2020-24**

Source: First Berlin Equity Research

COMPETITIVE POSITION

So far there are only a few market players who specialise in the APV field. In Germany, these includeNext2Sun and Baywa r.e.
The system concept of **Next2Sun** GmbH, founded in 2015, consists of the vertical installation of bifacial modules, which utilise solar radiation from both sides. The module sides face east or west. This means that electricity is generated primarily in the morning or evening. The areas between the module rows can still be used for agriculture. Next2Sun has brought its system concept to market maturity together with its parent company Ökostrom Saar GmbH and Solverde Bürgerkraftwerke Energiegenossenschaft eG. After the commissioning of several small pilot systems and a first large PV system with a capacity of 2 MW in Saarland in 2018, the first commercial agricultural photovoltaic system was officially commissioned in Donaueschingen in Germany in October 2020. The plant has an output of 4.1 MWp, a size of 14.1 ha and an investment volume of around €3.3m.
Next2Sun's system concept allows the simultaneous use of areas for agricultural and electricity production, but it lacks the protective functions of TubeSolar’s technology (protection offered by partial shading against excessive sunlight and drying out, protection against heavy rain and hail). In view of the increasing weather extremes caused by climate change, TubeSolar technology offers significant added value, especially in dry, sunny regions.

The 100% subsidiary of the agricultural trader BayWa, **BayWa r.e. renewable energy** GmbH, is also active in APV. In July 2020, the company completed the expansion of a pilot plant to 2.7 MWp on a fruit farm in the Netherlands. The latest expansion includes the installation of 10,250 solar modules on 3.2 hectares of raspberry cultivation area. The monitoring during the pilot period showed that the climate under the modules is more stable than under the conventional protective foil tunnels. The modules generate a lower temperature which is advantageous for the plants and better protects them against the weather. In order to achieve an even distribution of sunlight for raspberry cultivation, the company has developed a semitransparent solar module with sufficient light permeability that protects against hail, heavy rain and direct sunlight at the same time.
We see BayWa's system concept as a significant competing product. However, it focuses on the substitution of foil tunnels while TubeSolar systems are suitable for wider use. In contrast to the TubeSolar system, Baywa's flat module concept does not ensure an even distribution of rainwater.

Many APV systems use classic flat modules which are mounted at a sufficient distance from one another (usually several meters). Systems of this type also compete with TubeSolar's product. However, we assume that, in future, innovative APV system concepts that will increasingly replace classic flat modules. Overall, the growth of the APV segment in the next few years should be so strong that no significant competitive pressure will arise.

MARKET ENVIRONMENT

In recent years, photovoltaics has established itself worldwide as an inexpensive and largely CO_2-free technology for electricity production. At the end of 2019, at least 627 GW were installed worldwide (IEA-PVPS: Snapshot of Global PV Markets 2020). According to the German Solar Industry Association (BSW-Solar), German PV capacity was above 49 GW at the end of 2019. Thus, photovoltaics' share of German gross electricity consumption was 8%. New PV power plants with an output of more than one MW produce electricity in Germany at a cost of 4-6 €ct/kWh (Fraunhofer ISE 2020: Current facts about photovoltaics in Germany). Considering the external costs of fossil power plants, photovoltaics should therefore have the lowest electricity generation costs of all types of electrification, even given the limited sunshine in Germany. In sunny regions of the world, the prices for PV in tenders have fallen as far as 2 $ct/kWh (IEA PVPS, p. 15). In its "Global Energy Outlook 2020" published in October 2020, the IEA describes photovoltaics as the new king of electricity. Photovoltaic is consistently cheaper than new coal or gas-fired power plants in most countries, and solar projects currently offer the lowest electricity costs ever observed.

Since TubeSolar systems are primarily intended to be used for agro-PV, we concentrate on this relatively young market sector in our market analysis. The research institute Fraunhofer ISE defines APV based on the Food and Agriculture Organisation (FAO) of the United Nations as follows:

> "The APV system technology enables the simultaneous primary agricultural production and (secondary) solar power production on the same area and tries to optimally use synergy effects and potentials of both production systems."

OVERVIEW OF SCIENTIFIC STUDIES

Recent research on APV shows both the great global potential of APV and the positive effects of APV on the growth of various plants.

In their work published in August 2019, researchers at Oregon State University confirm that APV has great potential for sustainable electricity production. According to their study published in the journal Nature's Scientific Reports less than 1% of the global agricultural area is theoretically sufficient to meet global energy demand (approx. 21 PWh) with solar power. In practice, however, more space is required due to the lack of electricity storage and the time variance in the availability of solar energy.

A study on agrophotovoltaics in arid areas published in September 2019 in the online journal Nature Sustainability concluded that shading by PV systems protects plants (here: chilli, peppers and cherry tomatoes) against drought and heat and increases food production. At the same time, the heat stress of the modules is reduced by the evaporative cooling of the plants, which can increase the module efficiency. According to researchers at the University of Arizona, agrophotovoltaics have positive effects on the three components food production, water supply and energy production. Further scientific studies prove the successful cultivation of plants such as aloe vera, tomatoes, corn and lettuce under APV conditions.

The study "Agrophotovoltaic systems: applications, challenges and opportunities. A review." from June 2019 assumes that the APV can raise the total productivity of agricultural land (arable farming and power generation) by up to 70%. The researchers expect various positive synergy effects such as improved water productivity and protection of plants from high levels of solar radiation, especially in arid regions.

According to present models, global food production is increasingly impaired by water scarcity associated with climate change. Many areas in North, Central and South America, the Middle East and North Africa are showing a trend towards higher aridity. For Africa and Southeast Asia alone, climate change is likely to result in a decrease in food production of 8-45%. In this respect, the APV offers double potential: additional electricity production and enhanced food production.

For agriculture, the APV offers the additional option of independent power generation. In addition to cost savings through self-consumption there are new income opportunities through feeding self-generated electricity into the local grid. In the future, it is conceivable that APV will be combined with new technologies such as electricity storage and that the generated energy will be used to power agricultural machinery and other vehicles.

EXAMPLES OF APPLICATIONS FOR APV

The APV is being successfully tested in many applications at various locations in Germany and abroad. In Germany, a 2,500 m² APV pilot plant with a capacity of 194 kWp was inaugurated in Herdwangen-Schönach at Lake Constance in September 2016. This system is a joint project of the Fraunhofer Institute for Solar Energy Systems (ISE), BayWa r.e. Solar Projects GmbH, Elektrizitätswerke Schönau, Hofgemeinschaft Heggelbach, Karlsruhe Institute of Technology, Regional Association Bodensee-Oberschwaben and the University of Hohenheim.

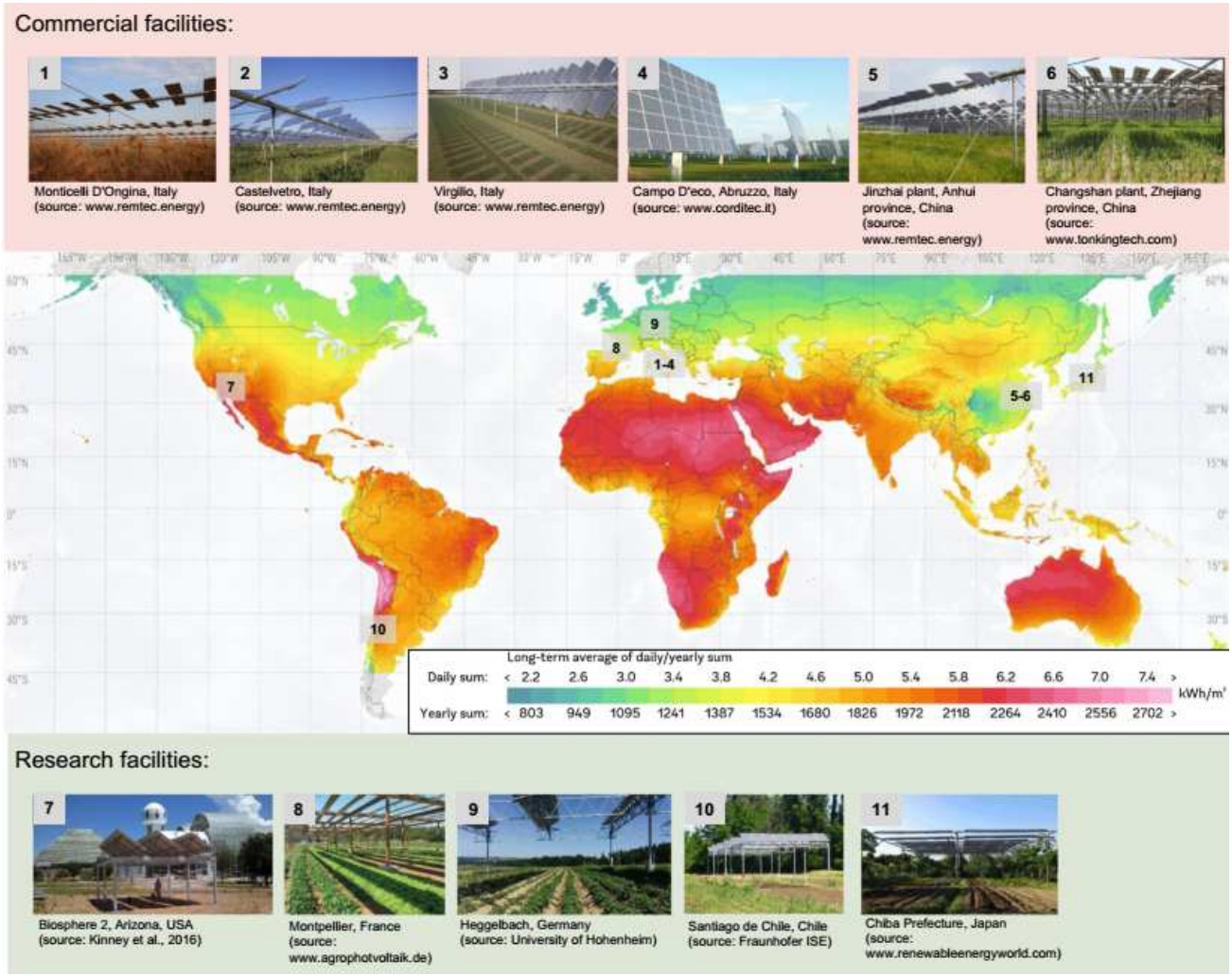
This project, named APV-RESOLA (AgroPhotoVoltaics RESOurce-efficient LAnd use), is funded by the Federal Ministry of Education and Research and FONA (Research for Sustainable Development). The practical test showed that partial shading from the solar modules improved agricultural harvest yields in the hot summer of 2018. The pilot system uses bifacial flat modules. Several rows of modules provide partial shade, while the spaces between them (6.3 metres) provide sufficient sunlight (see figure 15 overleaf). Overall, the plants under the system should receive around 60% of the photosynthetically active radiation above the system.

Figure 15: Harvesting winter wheat under the PV system

Source: First Berlin Equity Research, Fraunhofer ISE

Further examples of APV systems can be found in Italy, China, the USA, France, Chile and Japan (see figure 16 overleaf). Some of the systems have tracking technology. The specified system capacities vary between 13 kW and 30 MW. The plants cultivated under the systems cover a wide range from winter wheat, corn, rice, potatoes, tomatoes, eggplants, watermelons, lettuce, onions, pumpkins, to cucumbers and peanuts.

Figure 16: Overview of APV projects with location information



Source: First Berlin Equity Research, Weselek, A., Ehmann, A., Zikeli, S. et al. (2019), p.5

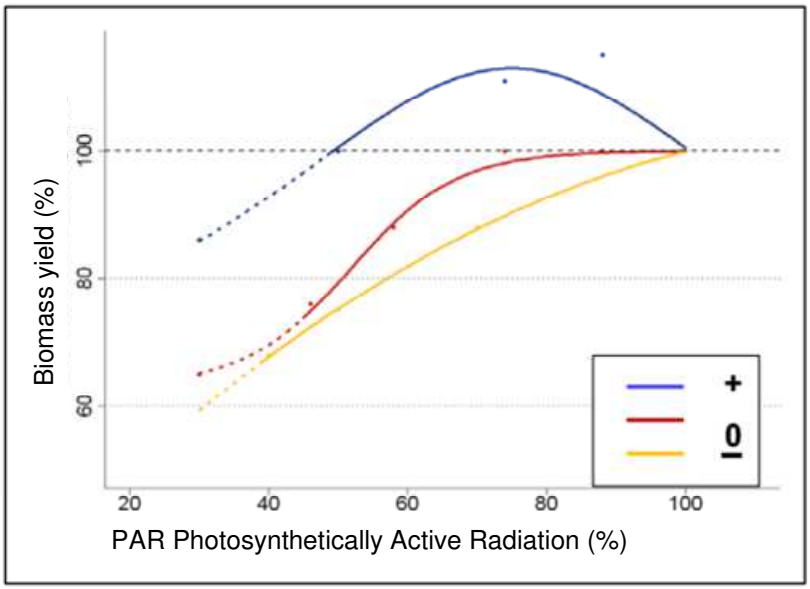
MARKET POTENTIAL

According to scientific estimates, around 2,200 APV systems with a total capacity of 2.8 GW have been installed since 2014 (Schindele et al. (2020), p. 2). Fraunhofer ISE has prepared a potential analysis for APV for Germany. For this purpose, the most important arable crops in Germany were divided into three categories, depending on the effect that partial shading has on yield (see figure 17 overleaf):

- higher yield (+)
- lower yield (0)
- significant lower yield (-)

The reference point is the yield with 100% photosynthetically active radiation.

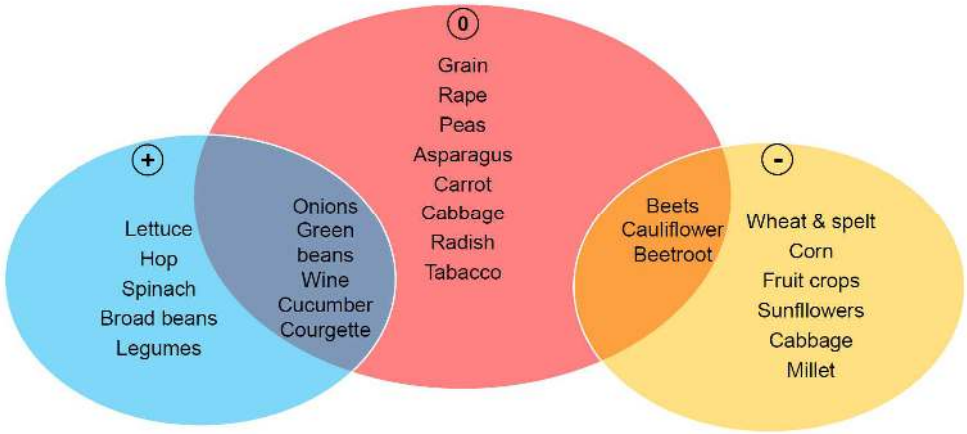
Figure 17: Biomass yield curves for different radiation intensities



Source: First Berlin Equity Research, Trommsdorff (2018), p. 14

The following figure shows the crops for which higher yields can be expected with partial shade (left circle) and for which plant species only slightly lower yields (middle circle) can be expected. The right circle lists the plants that are likely to have significant yield reductions.

Figure 18: Categorisation of the most important arable crops in Germany



Source: First Berlin Equity Research, Trommsdorff (2018), p.13

Fraunhofer ISE states the arable agricultural area in Germany at approx. 13.3m hectares and derives a theoretical APV potential of approx. 6,650 GWp from this. This is based on the implicit assumption that 1 ha is required for an APV output of 0.5 MWp. The ISE has considered the areas that fall into categories (+) and (0) as technical potential. This leads to an area of 1.2m hectares and an APV potential of 600 GWp. The ISE assumes an exploitable potential of 10% of the technical potential which corresponds to an area of 120,000 ha or a PV potential of approx. 60 GWp. For comparison: The cumulative installed PV capacity in Germany was 49 GWp at the end of 2019. APV thus has the potential to more than double PV capacity in Germany.

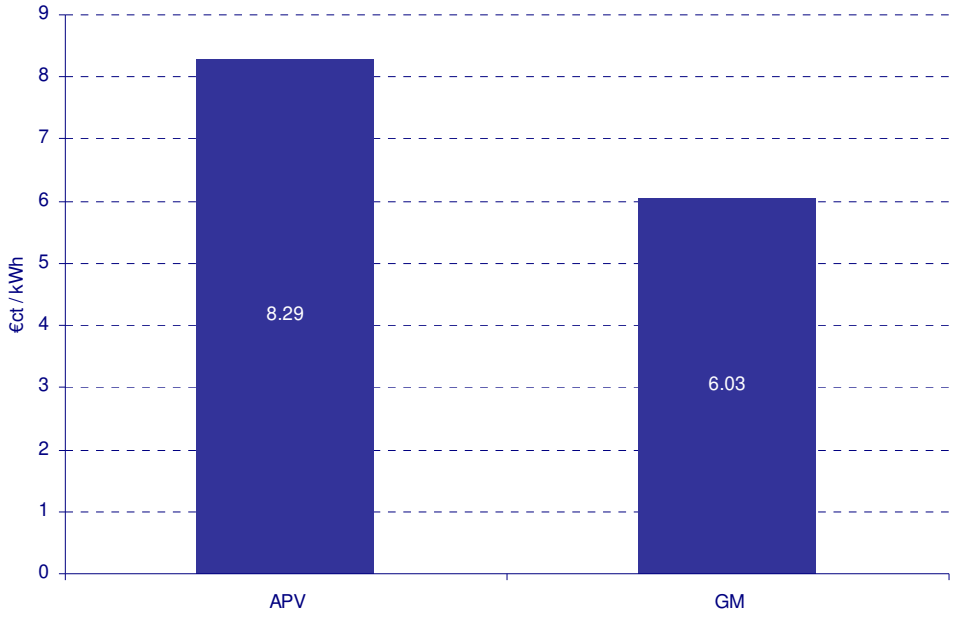
According to the Intergovernmental Panel on Climate Change (IPCC (2019), p.6), the global ice-free land area is 130m km². Around 12% of this is used as irrigated or non-irrigated cultivation area which corresponds to an area of almost 16m km². If 1% of this area, 160,000 km² or 16m ha, were used for APV and 2 ha of area were required for 1 MWp, this would result in a PV output of approx. 8,000 GWp. For comparison: the cumulative global PV capacity at the end of 2019 was 627 GWp. The APV potential derived in this way is roughly 13 times the currently installed PV base. The APV thus has a barely exhaustible area potential available for decades.

ELECTRICITY GENERATION COSTS FOR APV

Based on the data from the Heggelbach pilot plant, the ISE compared the electricity generation costs (LCoE) for an APV plant and a ground-mounted plant under the following assumptions:

- Area: 2 ha,
- Capacity APV system: 1.04 MWp,
- Capacity ground-mounted installation (GM): 1.38 MWp,

Figure 19: Comparison of electricity generation costs in €ct/kWh of APV and open-space systems



Source: First Berlin Equity Research, Schindele et al (2020), p. 9

According to calculations by Fraunhofer ISE, electricity production costs for APV in Germany are currently 38% higher than for ground-mounted systems at 8.29 €ct/kWh. According to the German Association of Energy and Water Management (BDEW), the average industrial electricity price in 2019 was 18.44 €ct/kWh. According to the Federal Ministry of Economics, the average electricity price for a household was 30.43 €ct/kWh in 2019. This would make self-consumption very lucrative for agricultural companies.
As a relatively new technology, agro-PV is only just beginning to lower the cost curve. For example, the assumption that an APV system with an output of 1 MW needs an area of 2 hectares is based on the flat module concept with large spaces between the modules to give

the plants enough sunlight. The future TubeSolar systems should only need 1.7 hectare for 1 MW capacity. In regions with more sunshine, it is already realistic that Levelised Costs of Energy make up half the costs in Germany due to the higher solar radiation alone.

REGULATION

There are several countries around the world that promote APV. These include Japan, South Korea, China, France, and the state of Massachusetts in the United States. In many countries the political discussion about suitable framework conditions for APV is just beginning. These include e.g. Germany, Italy, and Chile.

Japan: In 2013, the Japanese Ministry of Agriculture, Forestry and Fisheries introduced a regulation that allows the installation of photovoltaic systems on agricultural land only if at least 80% of agricultural yield of the crops grown under photovoltaic modules continue to be achieved. A total of 1,654 APV projects were implemented between 2013 and 2018. The total installed APV capacity in the period mentioned amounts to approx. 150 MWp.

South Korea: The South Korean government has been supporting the implementation of agrophotovoltaic projects since autumn 2018. The current political goal is to increase the share of renewable energies from 7% in 2016 to 20% by 2030. Photovoltaic capacity is to increase from 7.9 GWp in 2018 to 30.8 GWp by 2030, of which 10 GWp are to be set up as APV on agricultural land. Similarly to Japan, South Korea supports modest-sized projects with an average output of approx. 100 kWp. This should lead to around 100,000 APV systems by 2030. In April 2019, a total of 18 APV systems with an estimated total capacity of 2 MWp were installed. The average investment was 1.520 €/kWp with a system size of 100 kWp. The APV land use efficiency is 435 kWp per hectare. The construction of APV plants is subsidised for plants where exports exceed imports, so that a decrease in crop yields due to APV does not lead to a food shortage. The Korean Agrivoltaic Association (KAVA) receives government support to train technicians and farmers to use APV.

China: By far the largest agro-PV projects and the highest installed APV capacity can be found in China; Between 2015 and 2018, an estimated 4.0 GWp of PV capacity related to agricultural production was installed, of which around 2.3 GWp as solar greenhouses and 1.7 GWp as APV. The largest APV plant is located in Ningxia and was built by Huawei Fusion Solar in 2016. It has a capacity of over 700 MWp. Other Chinese PV companies such as Talesun and Jinko have also installed large APV systems.

France: In the European Union (EU), France was the first country to introduce a financial support programme for agrophotovoltaics in September 2017. Under the French Energy Law (Code de l'Énergie), the French Energy Regulation Commission (CRE) launched a specific tender for APV with a total capacity of 45 MWp. Between 2017 and 2019, 15 MWp of APV capacity was tendered in three auctions. Political drivers are the loss of arable land and the need to adapt agriculture to climate change, particularly the effects on food supplies and droughts. At the first auction, the average bid value for APV was €8.65 ct/kWh.

Massachusetts, (USA): In 2018, Massachusetts became the first state in the USA to support double land use through agrophotovoltaics. The Solar Massachusetts Renewable Target (SMART) programme regulates the incentives related to new solar photovoltaic developments. In order to be eligible for remuneration as an agricultural solar tariff generation unit, an agrophotovoltaic system must be installed on a property that is officially defined as land for agricultural use or as prime agricultural arable land. During the growing season, the maximum reduction in sunlight by shading through photovoltaic panels on each square meter of land under the dual-use system must not be more than 50%. To prove this, a shadow analysis must be carried out using a state analysis tool. The feed-in tariff is

between 14 and 26 $ct/kWh and depends on the size of the system and the local supplier. Dual-purpose systems that are qualified as agricultural solar power tariff generation units receive an additional 6 $ct/kWh. The APV system size is limited to 2 MWp. Fixed sloped modules must be at least eight feet and modules on tracking systems in a horizontal position at least ten feet from the ground.

MANAGEMENT

Board

Reiner Egner (63) has been an independent consultant for various project developers since 2008 and is responsible for the acquisition and development of projects in the areas of infrastructure and renewable energies as well as their financing. Mr. Egner is a banker and worked for seven years on the executive committee of an international financial service provider. Afterwards he was responsible for the development and co-management of MDL-Mitteldeutsche Leasing, LB Sachsen for three years. Before that, he built up the Debis Leasing subsidiary Daimler Benz for 5 years as head and was responsible for the financing of the areas of transport, traffic and infrastructure. Mr. Egner started his professional career at the Landesbank Baden-Württemberg and later as a branch director in the Dresdner Bank group at the KGAL/Discont und Kredit AG group. At GEFA, a subsidiary of Deutsche Bank, he was responsible for the corporate customer area as corporate customer advisor. In his first 12 years in the banking sector, his focus was on national and international project finance and structured finance.

Jürgen Gallina (51) worked at Osram for 20 years. Most recently, he was Head of Equipment Engineering (EE) at Osram in Augsburg, an area for special machine construction (engineering and construction) with around 230 employees. His positions at Osram included heading the Automation Technology (AT) division, special machine construction (construction only) in Augsburg with 150 employees. Before that, Mr. Gallina was plant manager at the Bruntal plant in the Czech Republic with around 1,100 employees, department manager at Machine Technology (MT) in Schwabmünchen, responsible for machine technology with around 30 employees and cost center manager in Schwabmünchen, a production cost center with around 50 employees. Mr. Gallina is a graduate engineer (FH) and MBA (univ.). He started his career as an engineer at Heba-Pac GmbH, Blaubeuren, before starting his career at Osram as a process engineer at Osram GmbH, Schwabmünchen, and at Osram Sylvania in Towanda (USA).

Supervisory board

Stefan Schütze, Frankfurt am Main, lawyer (chairman)
Mr Schütze has been a member of the Board of Management of FinLab AG, a listed investment company, since 2013, and is particularly responsible for the areas of Investments and Legal & Compliance. Before joining FinLab AG, he worked for listed venture capital firms in Berlin and Frankfurt. In addition to his work at FinLab AG, he is a member of the supervisory board of listed companies and participations in the FinLab Group. Mr. Schütze studied law and holds a Master's Degree (LL.M.) in Mergers & Acquisitions.

Jeanette Steinbach, Nuremberg, tax advisor (deputy chairwoman)
Mrs Steinbach has been Managing Director of Balance Steuerberatungsgesellschaft Nürnberg GmbH since 2007. Before founding this company, she worked first in the Bavarian financial administration and then in tax firms. Mrs Steinbach has been admitted as a tax advisor since 1995.

Herbert Seuling, Kulmbach, independent management consultant (member)
From 1997 to 2017, Mr Seuling was a managing partner of C.P.A. Group which provides consulting services in the field of tax and legal advice as well as auditing through various companies and with around 100 employees is one of the largest consulting companies in Northern Bavaria. Currently, Mr Seuling is the managing director of M & S Monitoring GmbH, which offers advice on corporate financing and Mergers & Acquisitions. Mr Seuling holds a degree in business administration Univ.

SHAREHOLDERS & STOCK INFORMATION

Stock Information	
ISIN	DE000A2PXQD4
WKN	A2PXQD
Bloomberg ticker	9TS GR
No. of issued shares	10.000.000
Transparency Standard	Open Market
Country	Germany
Sector	Renewable Energies
Subsector	Photovoltaics

Source: Börse Frankfurt, First Berlin Equity Research

Shareholder Structure	
TSG 1. Vermögensverw. GmbH	55.2%
BD Vermögensverw. GmbH	11.1%
Solar Invest International SE	9.7%
BF Holding GmbH	5.1%

Source: TubeSolar AG

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INCOME STATEMENT

All figures in EUR '000	2019A	2020E	2021E	2022E	2023E	2024E	2025E
Revenues	**0**	**0**	**0**	**25,600**	**84,240**	**140,000**	**167,500**
Cost of goods sold	0	1,956	2,500	12,800	42,120	72,545	89,841
Gross profit	**0**	**-1,956**	**-2,500**	**12,800**	**42,120**	**67,455**	**77,659**
Personnel costs	297	2,142	2,904	4,084	9,821	10,698	13,082
Other operating income	177	512	6,000	2,995	1,348	1,400	1,675
Other operating expenses	134	1,625	3,347	4,762	9,688	11,200	11,893
EBITDA	**-254**	**-1,466**	**1,744**	**6,950**	**23,959**	**46,957**	**54,360**
Depreciation and amortisation	0	1,192	2,910	6,492	10,495	13,420	15,304
Operating income (EBIT)	**-254**	**-2,658**	**-1,166**	**458**	**13,464**	**33,537**	**39,055**
Net financial result	0	-12	-400	-1,710	-2,175	-2,300	-2,275
Non-operating expenses	0	0	0	0	0	0	0
Pre-tax income (EBT)	**-254**	**-2,670**	**-1,566**	**-1,252**	**11,289**	**31,237**	**36,780**
Income taxes	0	267	-470	-376	1,693	9,371	11,034
Minority interests	0	0	0	0	0	0	0
Net income / loss	**-254**	**-2,937**	**-1,096**	**-876**	**9,596**	**21,866**	**25,746**
Diluted EPS (in €)	**-0.03**	**-0.29**	**-0.09**	**-0.06**	**0.62**	**1.41**	**1.66**
Ratios							
Gross margin	0.0%	0.0%	0.0%	50.0%	50.0%	48.2%	46.4%
EBITDA margin on revenues	0.0%	0.0%	0.0%	27.1%	28.4%	33.5%	32.5%
EBIT margin on revenues	0.0%	0.0%	0.0%	1.8%	16.0%	24.0%	23.3%
Net margin on revenues	0.0%	0.0%	0.0%	-3.4%	11.4%	15.6%	15.4%
Tax rate	0.0%	-10.0%	30.0%	30.0%	15.0%	30.0%	30.0%
Expenses as % of revenues							
Personnel costs	n.m.	n.m.	n.m.	16.0%	11.7%	7.6%	7.8%
Depreciation and amortisation	n.m.	n.m.	n.m.	25.4%	12.5%	9.6%	9.1%
Other operating expenses	n.m.	n.m.	n.m.	18.6%	11.5%	8.0%	7.1%
Y-Y Growth		n.m.	n.m.				
Revenues	n.m.	n.m.	n.m.	n.m.	229.1%	66.2%	19.6%
Operating income	n.m.	n.m.	n.m.	n.m.	2839.8%	149.1%	16.5%
Net income/ loss	n.m.	n.m.	n.m.	n.m.	n.m.	127.9%	17.7%

BALANCE SHEET

All figures in EUR '000	2019A	2020E	2021E	2022E	2023E	2024E	2025E
Assets							
Current assets, total	**3,950**	**3,325**	**9,983**	**24,645**	**11,951**	**25,402**	**58,618**
Cash and cash equivalents	3,950	3,025	8,783	21,489	1,565	7,042	35,290
Short-term investments	0	0	0	0	0	0	0
Receivables	0	200	200	2,104	6,924	11,856	14,601
Inventories	0	100	1,000	1,052	3,462	6,505	8,727
Other current assets	0	0	0	0	0	0	0
Non-current assets, total	**7,070**	**14,364**	**35,058**	**72,822**	**102,749**	**113,991**	**107,046**
Property, plant & equipment	0	6,742	28,494	67,080	97,689	109,478	102,859
Goodwill & other intangibles	0	7,397	6,339	5,518	4,835	4,288	3,962
Other assets	7,070	225	225	225	225	225	225
Total assets	**11,020**	**17,689**	**45,041**	**97,468**	**114,700**	**139,393**	**165,664**
Shareholders' equity & debt							
Current liabilities, total	**418**	**417**	**452**	**1,755**	**4,391**	**8,219**	**23,744**
Short-term debt	0	0	0	0	0	1,000	15,000
Accounts payable	65	65	100	1,403	4,039	6,866	8,391
Current provisions	0	0	0	0	0	0	0
Other current liabilities	352	352	352	352	352	352	352
Long-term liabilities, total	**61**	**2,667**	**19,082**	**44,082**	**49,082**	**48,082**	**33,082**
Long-term debt	0	1,000	16,000	41,000	46,000	45,000	30,000
Deferred revenue	0	0	0	0	0	0	0
Other liabilities	61	1,667	3,082	3,082	3,082	3,082	3,082
Minority interests	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shareholders' equity	**10,541**	**14,604**	**25,507**	**51,631**	**61,227**	**83,092**	**108,839**
Share capital	10,000	11,000	12,500	15,500	15,500	15,500	15,500
Capital reserve	795	6,795	17,295	41,295	41,295	41,295	41,295
Other reserves	0	0	0	0	0	0	0
Treasury stock	0	0	0	0	0	0	0
Loss carryforward / retained earnings	-254	-3,191	-4,288	-5,164	4,432	26,298	52,044
Total consolidated equity and debt	**11,020**	**17,689**	**45,041**	**97,468**	**114,700**	**139,393**	**165,664**
Ratios							
Current ratio (x)	9.45	7.96	22.06	14.04	2.72	3.09	2.47
Quick ratio (x)	9.45	7.72	19.85	13.44	1.93	2.30	2.10
Net debt	-3,950	-2,025	7,217	19,511	44,435	38,958	9,710
Net gearing	-37.5%	-13.9%	28.3%	37.8%	72.6%	46.9%	8.9%
Equity ratio	95.7%	82.6%	56.6%	53.0%	53.4%	59.6%	65.7%
Book value per share (in €)	1.05	1.46	2.13	3.69	3.95	5.36	7.02
Return on equity (ROE)	-2.4%	-20.1%	-4.3%	-1.7%	15.7%	26.3%	23.7%
Days of sales outstanding (DSO)	0.0	0.0	0.0	30.0	30.0	30.9	31.8
Days inventory outstanding	0.0	18.7	146.0	30.0	30.0	32.7	35.5
Days in payables (DIP)	0.0	12.1	14.6	40.0	35.0	34.5	34.1

CASH FLOW STATEMENT

All figures in EUR '000	2019A	2020E	2021E	2022E	2023E	2024E	2025E
EBIT	**-254**	**-2,658**	**-1,166**	**458**	**13,464**	**33,537**	**39,055**
Depreciation and amortisation	0	1,192	2,910	6,492	10,495	13,420	15,304
EBITDA	**-254**	**-1,466**	**1,744**	**6,950**	**23,959**	**46,957**	**54,360**
Changes in working capital	0	-300	-865	-653	-4,593	-5,147	-3,443
Other adjustments	0	-279	70	-1,334	-3,868	-11,671	-13,309
Operating cash flow	**-254**	**-2,045**	**949**	**4,962**	**15,497**	**30,138**	**37,608**
Investments in PP&E	0	-6,880	-22,190	-44,000	-40,000	-24,000	-7,614
Investments in intangibles	0	0	0	-256	-421	-662	-746
Free cash flow	**-254**	**-8,925**	**-21,241**	**-39,294**	**-24,924**	**5,476**	**29,248**
Acquisitions & disposals, net	0	0	0	0	0	0	0
Other investments	0	0	0	0	0	0	0
Investment cash flow	**0**	**-6,880**	**-22,190**	**-44,256**	**-40,421**	**-24,662**	**-8,360**
Debt financing, net	0	1,000	15,000	25,000	5,000	0	-1,000
Equity financing, net	0	7,000	12,000	27,000	0	0	0
Dividends paid	0	0	0	0	0	0	0
Other financing	0	0	0	0	0	0	0
Financing cash flow	**0**	**8,000**	**27,000**	**52,000**	**5,000**	**0**	**-1,000**
FOREX & other effects	0	0	0	0	0	0	0
Net cash flows	**-254**	**-925**	**5,759**	**12,706**	**-19,924**	**5,476**	**28,248**
Cash, start of the year	0	3,950	3,025	8,783	21,489	1,565	7,042
Cash, end of the year	**-254**	**3,025**	**8,783**	**21,489**	**1,565**	**7,042**	**35,290**
EBITDA/share (in €)	**-0.03**	**-0.15**	**0.15**	**0.50**	**1.55**	**3.03**	**3.51**
Y-Y Growth							
Operating cash flow	n.m.	n.m.	n.m.	422.9%	212.3%	94.5%	24.8%
Free cash flow	n.m.	n.m.	n.m.	n.m.	n.m.	n.m.	434.1%
EBITDA/share	n.m.	n.m.	n.m.	241.6%	211.4%	96.0%	15.8%

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PRICE TARGET DATES

Unless otherwise indicated, current prices refer to the closing prices of the previous trading day.

AGREEMENT WITH THE ANALYSED COMPANY AND MAINTENANCE OF OBJECTIVITY

The present financial analysis is based on the author's own knowledge and research. The author prepared this study without any direct or indirect influence exerted on the part of the analysed company. Parts of the financial analysis were possibly provided to the analysed company prior to publication in order to avoid inaccuracies in the representation of facts. However, no substantial changes were made at the request of the analysed company following any such provision.

ASSET VALUATION SYSTEM

First Berlin's system for asset valuation is divided into an asset recommendation and a risk assessment.

ASSET RECOMMENDATION

The recommendations determined in accordance with the share price trend anticipated by First Berlin in the respectively indicated investment period are as follows:

Category		1	2
Current market capitalisation (in €)		0 - 2 billion	> 2 billion
Strong Buy[1]	An expected favourable price trend of:	> 50%	> 30%
Buy	An expected favourable price trend of:	> 25%	> 15%
Add	An expected favourable price trend of:	0% to 25%	0% to 15%
Reduce	An expected negative price trend of:	0% to -15%	0% to -10%
Sell	An expected negative price trend of:	< -15%	< -10%

[1] The expected price trend is in combination with sizable confidence in the quality and forecast security of management.

Our recommendation system places each company into one of two market capitalisation categories. Category 1 companies have a market capitalisation of €0 – €2 billion, and Category 2 companies have a market capitalisation of > €2 billion. The expected return thresholds underlying our recommendation system are lower for Category 2 companies than for Category 1 companies. This reflects the generally lower level of risk associated with higher market capitalisation companies.

RISK ASSESSMENT

The First Berlin categories for risk assessment are low, average, high and speculative. They are determined by ten factors: Corporate governance, quality of earnings, management strength, balance sheet and financial risk, competitive position, standard of financial disclosure, regulatory and political uncertainty, strength of brandname, market capitalisation and free float. These risk factors are incorporated into the First Berlin valuation models and are thus included in the target prices. First Berlin customers may request the models.

RECOMMENDATION & PRICE TARGET HISTORY

Report No.:	Date of publication	Previous day closing price	Recommendation	Price target
Initial Report	Today	€6.60	Buy	€9.40

INVESTMENT HORIZON

Unless otherwise stated in the financial analysis, the ratings refer to an investment period of twelve months.

UPDATES

At the time of publication of this financial analysis it is not certain whether, when and on what occasion an update will be provided. In general First Berlin strives to review the financial analysis for its topicality and, if required, to update it in a very timely manner in connection with the reporting obligations of the analysed company or on the occasion of ad hoc notifications.

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Legally required information regarding

- **key sources of information in the preparation of this research report**
- **valuation methods and principles**
- **sensitivity of valuation parameters**

can be accessed through the following internet link: https://firstberlin.com/disclaimer-english-link/

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