

RENEWABLE ENERGY REFRESHER

BERGEN GROUP NEWSLETTER



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BASIC CUSTOMS DUTY ON SOLAR MODULES, CELLS LIKELY NEXT WEEK

- MNRE has asked for a 40% duty on Modules & 25% on cells for a period of 5 years.
- Manufacturers have expressed to the Minister that, within 2 years of its introduction, the duty would lead to a rise in the domestic solar module production capacity from around 9-10GW today to 30GW and in the domestic solar cell manufacturing capacity from 2.5GW to 20-25GW.
- Additionally, the country can build up solar wafer & polysilicon manufacturing capacity from zero at present to 10GW each in three years.

This policy decision is definitely going to spurr the investors sentiments in PV sector, therefore, require comparable development in logistics, skill development, and R& D support.

Wafer Size Conundrum

PV sector has been witnessing fast changes both in process technologies and wafer sizes in last 3-4 years. In case of wafer sizes, situation has been changing more dramatically, hence very confusing. Up to 2016 wafer size of 156mmx156mm (multi and Mono both) was the standard since last one decade. Around 2017 came in the M2 wafers of 156.75mmx156.75mm size and while industry (both cell and module manufacturers) was trying to adjust for this changed size of wafers, in 2019 M3 wafers of 158.75mmx158.75mm size were introduced and were quickly followed by M4 wafers of size 161.7mmx161.7mm.

It may be noted here that during this time in India no new manufacturing facilities either cell or module have been built, so all the existing manufacturing facilities had very difficult time to adjust to these new wafer sizes and most of them have now adjusted their facilities around M3 wafers of 158.75x158.75 size.

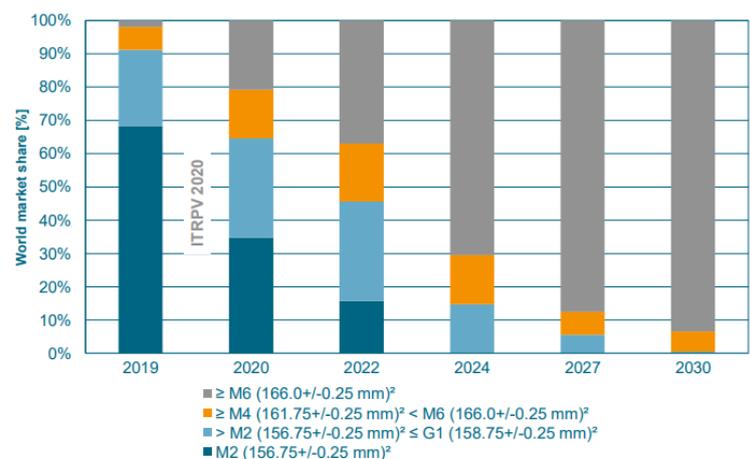
In the later part of 2019, M6 wafers of 166mmx166mm size were introduced and it appeared that this may become industry standard and will be main stay technology for some time. It was, however, not to be and already in the industry 182 mmx182mm size wafers (M10) are being processed to produce 500Wp modules. M12 wafers of 210mmx210mm size have also been introduced in the manufacturing, though in limited volume. It is expected that this fast-changing situation may stabilise around M10 and M12 wafers. Let us hope so.

Fortunately, now cell and module manufacturing equipment on offer are mostly universal with respect to wafer sizes capable of handling wafers from M3 to M12 sizes. So, what Indian manufacturers should do? Tough luck to existing ones, they have to replace their lines sooner or later. The new entrants should go for universal lines, though there may be some disadvantages with respect COO in this approach e.g., if line is capable of running M12 wafers and one runs only M6 wafers due to nonavailability of other higher size wafers (quite likely situation for coming few years) COO will be higher and line will not be used to its full potential for which the investment has been made. So, it could be a tough call to take, but so be it.

The Figure shows the ITRPV survey results about the market share of different wafer dimensions for Cz-mono-Si. The move from the 6" format 156*156mm² to the larger formats started in 2015. Today 6" wafers disappeared completely.

The figure shows, for Cz-mono-Si wafers the format of 156.75*156.75mm² (M2) will disappear but even faster within the next 3 years. M2 has about 30% share in 2020. Larger formats as 158.75*158.75 mm² (G1), 161.75*161.75 mm² (M4), 166*166mm² (M6) and 210*210 mm² (m12) have in 2020 about 70% market share-35% G1,20% M4, and 15% M6. M2 is also introduced in the market.

Different Cz-mono-Si wafer sizes



Dr. D.N. Singh

CEO

Bergen Solar Power & Energy Ltd.

NEWS UPDATE

BUDGET 2021-2022

The 2021-22 Budget tabled in the Parliament by the Finance Minister, Nirmala Sitharaman, has received a mixed response from stakeholders in the energy sector. While the massive outlay for revamping the power distribution sector was lauded across the board, the response to the Budget proposals from the renewable energy sector was not too enthusiastic. The industry is positive about the Budget outlays for Solar Energy Corporation of India (SECI) and Indian Renewable Energy Development Agency Limited (IREDA).

Some of the key proposals in the Budget include:

- ₹3.05 trillion (~\$41.92 billion) outlay for a revamped reforms-based result-linked power distribution sector program over five years
- Infusion of additional capital of ₹10 billion (~\$137 million) in SECI and ₹15 billion (~\$205.6 million) in IREDA
- Increase in customs duty on solar inverters from 5% to 20% and on solar lanterns from 5% to 15% to encourage domestic production
- The government has committed to providing about ₹1.97 trillion (~\$27.03 billion) over the next five years from the financial year 2021-22 to help bring scale and size to the solar photovoltaic (PV) manufacturing sector and generate new job opportunities. As a part of the commitment, ₹45 billion (~\$617 million) would be provided for high-efficiency solar PV modules manufacturing.
- Under the program, integrated solar manufacturing facilities (from the manufacturing of wafer-ingot to high-efficiency modules) with a total capacity of 10 GW, with direct investments of around ₹140 billion (~\$1.92 billion), will be set up by the fourth quarter of 2022-23

In Budget 2020, an allocation of ₹220 billion (~\$3.08 billion) went to the power and renewable sector. Some of the major budget outlays in the power sector include the ₹26 billion (~\$356 million) for solar power and ₹11 billion (~\$150 million) for wind power. The largest outlay was for the Integrated Power Development Scheme (IPDS), which received a whopping \$53 billion (~\$724 million). One of the main programs of IPDS is smart meter installations.

The program for Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India - (FAME- India) also received an outlay of ₹7.57 billion (~\$103.4 million) compared to ₹6.93 billion (~\$96.8 million) last year

Budget 2021-2022: Outlay on Major Programs

Major Central Sector Programs	2018-19 Actuals		2019-20 Actuals		2020-2021 BE		2020-2021 RE		2021-2022 BE	
	₹ Million	~\$ Million	₹ Million	~\$ Million	₹ Million	~\$ Million	₹ Million	~\$ Million	₹ Million	~\$ Million
Solar Power	19,040	260.1	19,953	272.6	25,158	343.7	15,754	215.2	26,060	356.0
Wind Power	9,500	129.8	10,260	140.2	12,990	177.5	10,590	144.7	11,000	150.3
Green Energy Corridors	5000 (BE)*	68.3	526	7.2	3,000	41.0	1,600	21.9	3,000	41.0
Kisan Urja Suraksha evam Utthaan Mahabhayan (KUSUM)	-	-	-	-	10,000	136.6	2,100	28.7	9,970	136.2
Deen Dayal Upadhyaya Gram Jyoti Yojna (DDUGJY)	38,000	519.1	39,260	536.3	45,000	614.8	20,000	273.2	36,000	491.8
Integrated Power Development Scheme	38,970	532.4	55,600	759.6	53,000	724.0	40,000	546.4	53,000	724.0
Strengthening of Power Systems	28,020	382.8	18,130	247.7	18,430	251.8	8,200	112.0	14,550	198.8
Power System Development Fund	5,440	74.3	5,550	75.8	5,740	78.4	8,240	112.6	5,740	78.4
Scheme for Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India - (FAME-India)	1,450	19.8	5,000	68.3	6,930	94.7	3,180	43.4	7,570	103.4

Note: BE - Budget estimates; RE - Revised Estimates

\$1 = ₹73.2

Source : indiabudget.gov.in
Mercom India Research

NEWS UPDATE

A Foldable Solar Cell With Conversion

Efficiency of 15.2%.

These cells can be integrated into appliances like phones, windows, vehicles, and indoor devices

Conventional c-Si PV cells are structurally rigid and fragile, so they can break apart when they are under extreme external forces. Furthermore, rectangular PV modules that contain c-Si PV cells can only be deployed on a flat surface such as the roof of a building. Scientists and engineers that are involved in the field of solar PV have therefore been working on flexible and foldable PV cells that could become renewable energy solutions for a wider range of applications. An international team of scientists working at the institution has recently developed a PV cell that technically can be folded in half without breaking. At the same time, this foldable PV cell has achieved a fairly decent conversion efficiency rate of 15.2%.

18% Efficiency For Perovskite Solar Modules

- CEA-INES Report 18% Power Conversion Efficiency on an active surface area of 10 cm² for Perovskite Solar Modules; Claim Technique Used Compatible With Integration On HJT Silicon Solar Cells For Tandem Architecture
- They carried out the coating step in air followed by a gas quenching conversion step to form perovskite material
- Layer thus formed was integrated in modules using laser ablation as a structuring process, minimizing inactive area with a fill factor of > 93%

- Coal India announced the incorporation of two wholly-owned subsidiaries of Coal India, one for the solar value chain (ingot-wafer-cell-module) business vertical and another for new and renewable energy. The incorporation will be subject to approval by the government of India
- Sterling and Wilson Solar, a global solar engineering, procurement, and construction services provider, has secured an order worth ₹9.3 billion (~\$127.5 million) from a Saudi Arabia-based renewable energy company in the Kom Ombo region of Egypt. The order is scheduled to be commissioned by the first quarter of 2022. The company has executed five projects of over 322 MWp in Benban Solar Park in Egypt.

NEWS UPDATE

MNRE Incentives Restricted to Rooftop Solar Systems Connected to the Grid

The rules to apply to all future tenders

The Ministry of New and Renewable Energy (MNRE) has issued amendments to the guidelines for the Phase II of the rooftop solar program. In the new guidelines, the Ministry has said that the implementing agency should assign a minimum of 10% of the total allocated quantity to the lowest bidder. If the vendor does not execute the allocated quantity, the bank guarantee will be encashed, and the vendor blacklisted for five years.

This new clause will be applicable for all future tenders and tenders which have already been floated, with the bid submission scheduled on or after March 06, 2021.

The Ministry clarified that only the grid-connected rooftop solar systems installed in the area of the DISCOM would be considered for the calculation of incentives. The projects that are not connected to the grid, generally called 'behind-the-meter' systems, will not be considered for incentives.

Gross Metering for Rooftop Solar Systems Over 10 kW Proposed in Karnataka

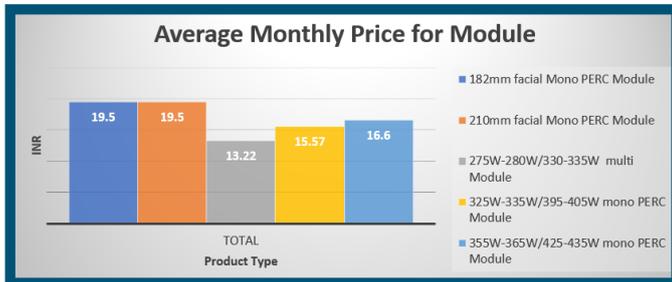
The state Commission suggested a generic tariff of ₹3.82/kWh for residential rooftop solar systems up to 10 kW

The Karnataka Electricity Regulatory Commission (KERC) has proposed allowing net metering for rooftop solar projects between 1 kW and 10 kW and gross metering for capacity over 10 kW. The Commission has suggested generic tariffs of ₹3.82 (~\$0.0526)/kWh for residential rooftop solar systems between 1 kW and 10 kW, and ₹2.84 (~\$0.0391)/kWh for projects between 1 kW and 2 MW (large-scale). In a discussion paper, KERC also proposed a tariff of ₹2.87 (~\$0.0395)/kWh for MW-scale ground-mounted projects. The proposed tariffs, among other suggestions made in the discussion paper, would be applicable for the control period between 2022 and 2024.

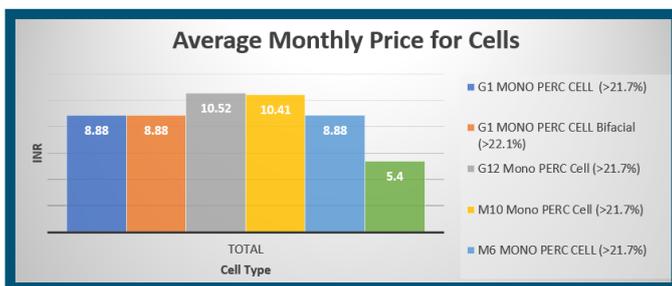
- Sterling and Wilson and Enel X Partner to Provide EV Charging Infrastructure. The new business will be incorporated on April 1, 2021
- Chief Minister of Delhi Arvind Kejriwal has launched the 'Switch Delhi' campaign, a mass awareness program to sensitize Delhi citizens about the environmental benefits of switching to electric vehicles (EV). The campaign also aims to make citizens aware of the incentives and infrastructure being developed under Delhi's EV policy.

PRICE UPDATE

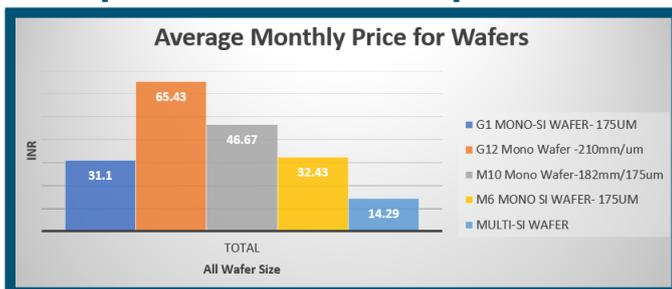
- Module Spot Price Update- Multi/Mono



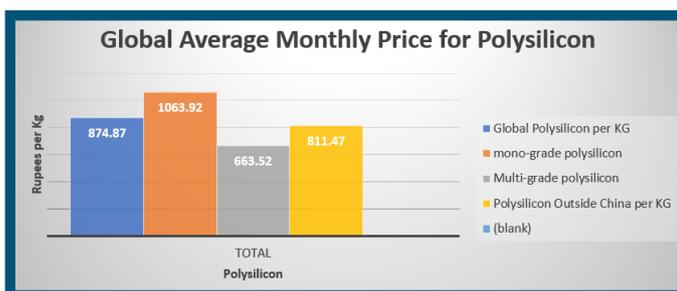
- Cell Spot Price Update- Multi/Mono/PERC



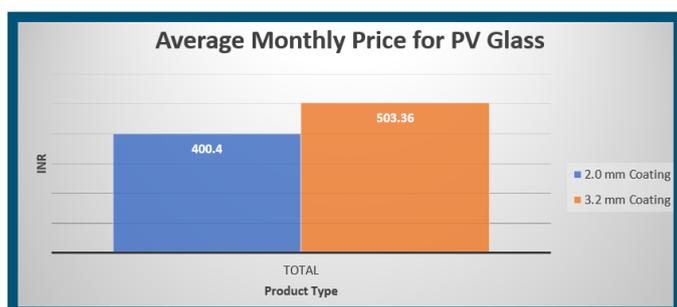
- Wafer Spot Market Price Update- Multi SI/MonoG1M6



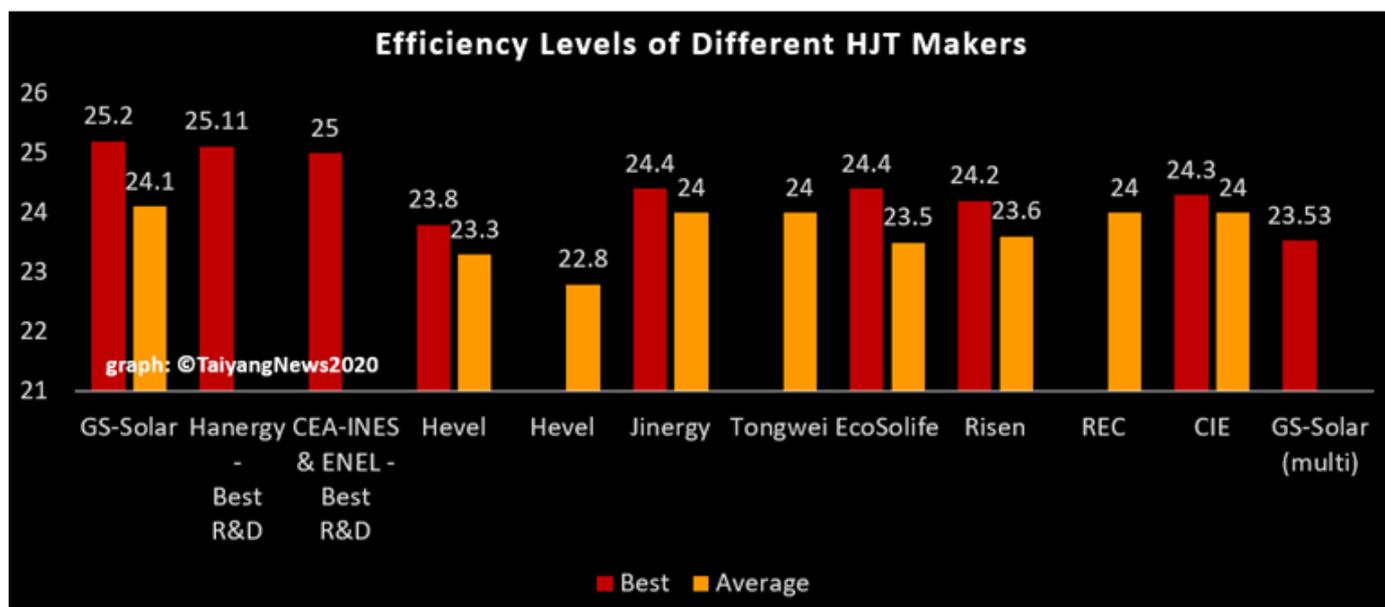
- Polysilicon Spot Price Update-Virgin poly (spot, contract)/Granular



- PV Glass Spot Price Update



TECHNOLOGY UPDATE



Source: TaiyangNews

KEY TAKEAWAYS

- Latest top efficiency for commercial size cells comes from GS-Solar at 25.2%
- HJT cell efficiency varies with metallization pattern – 5-busbars or multi-busbars
- At least 5 HJT makers attained average efficiency of 24% at cell level

PRODUCT UPDATE

AUTO BUSSING MACHINE



Model	ABM-180-II
Conveyor Height	980±30mm
Glass Size	length1630mm-2500mm, width950mm-1400mm
Adjustable string space	2-6mm
Bussing Ribbon Size	4-8mm (Width) , 0.2-0.4mm (Thickness) , Loading by ribbon roll(changing parts if width need to be adjusted)
Bussing ribbon accuracy	Length : ±0.5mm , right angle : ±1°
Loading box size	Inner bore φ16mm-φ25mm , OD≤φ200mm
Flux application method	Immersed
Soldering method	Hot air soldering
Defect rate	≤2%
Air Supply	0.5-0.8MPa
Air Consumption	2000L/min
Power Supply	AC380V±5%V , 50Hz , 3-phase 5-wire System
Power	Average Power:20KW , Rated Power:60KW
Dimension	4500mm(L)×2600mm(W)×2500mm(H)
Weight	4000KGS

- Full Compatibility with regular version
- Light customization for irregular version.
- High customization for special version.
- Compatible with 156-210mm cell, 5BB-12BB full size cell/half size cell, Double glass module.
- FULL CELL :- 6strings *10cells , 6strings* 12 cells
- HALFCELL:- 12 strings*10cells. 12strings*12 cells.
- CYCLE :-
Full cell ≤28s
Half Cell ≤22s
- SOLDERING METHOD :- Hot Air Soldering.

Note: BERGEN SOLAR POWER & ENERGY LIMITED IS THE SOLE REPRESENTER OF CONFIRMWARE FOR INDIA

EDITORIAL TEAM



Rajinder Kumar Kaura
CMD

With nearly 43 years of contributions in conventional and non conventional power & electronics field, he is pioneer and pathfinder in developing solar & electronic industry in India. His contributions in bridging the gap in standards of living between rural and urban population through generation of solar power and skill development has earned him tremendous respect and recognition by countries like Norway, Japan, Germany, etc besides State and Central organizations.



Dr. D.N. Singh
CEO

Dr. D.N. Singh is a one of the most prominent leaders in solar PV and Semiconductor technology and widely known professional in India and abroad. He has a total of 46 years of experience in Industries, research and academia. He has published over 40 research papers in international and national journals. He has been invited speaker at PV Cell Tech and PV Module tech international conferences. Dr. Singh is Vice-President of Microelectronic Society of India, member IEEE and member of National Nano-Technology working group.



Dronveer Kaura
Director

After completion of academics from The OHIO State University, US, he returned to India to share the knowledge gained in his academic and serve the nation. He founded and engaged himself and his team in Industrial Automation Projects to follow industry 4.0 standard and keep India intact and way forward in the state of art technology of Automation. Under his guidance and knowledge sharing, we could develop a efficient solution for Robot Automation in the field of automobile to boost per day production. He is currently pursuing Phd in Hydrogen Fuels & Technology.



S.K. Kaul
Vice President

Having more than 20 years of experience in the field of Manufacturing, Operation, Material Management & Factory Administration. and looking after complete solutions & supply of Capital Equipment, Technology for the manufacturing of Printed Circuit Boards, Electronic assemblies, Photovoltaic Cell & Photovoltaic Modules and undertaking the turnkey installation of the solar based power projects.