MINISTRY OF INDUSTRY AND TRADE	**THE SOCIALIST REPUBLIC OF VIETNAM** **Independence - Freedom - Happiness**
No.: 1931 /BCT-ĐL For: Proposed addition of wind power projects to the power development plan	*Hanoi, March 19, 2020*

Respectfully addressed: The Prime Minister

In implementing the Prime Minister's directive concerning the addition of wind power projects to the power development plan (PDP), the Ministry of Industry and Trade would like to report as follows:

I. Planning targets and development policies for wind power

I.1. Targets of developing wind power in the revised PDP VII

According to the revised PDP VII, the installed capacity target for wind power is about 800 MW by 2020, about 2,000 MW by 2025 and about 6,000 MW by 2030.

I.2. Policies

- The Prime Minister issued Decision No. 37/2011/QD-TTg dated June 29, 2011 on the mechanism to support the development of wind power projects in Vietnam (Decision No. 37/2011/QD-TTg) and Decision No. 39/2018/QD-TTg dated September 10, 2018 amending and supplementing a number of articles of Decision No. 37/2011/QD-TTg (Decision No. 39/2018/QD-TTg).

- The Ministry of Industry and Trade has issued Circular No. 02/2019/TT-BCT dated January 15, 2019 providing regulations on the development of wind power projects and standardized Power Purchase Agreement (PPA) for wind power projects (Circular No. 02/2019/TT-BCT), effective as of February 28, 2019.

II. Criteria for considering, appraising and approving addition of wind power projects to the PDP

Based on the policies to encourage the development of wind power projects on the principles of publicity and transparency, some basic criteria for considering, appraising and approving addition of wind power projects to the PDP are as follows:

- Advantages of the connection plan with the national power system.
- Wind potential in the proposed project area for inclusion in PDP.
- The alignment of the proposed project with the local land use master plans and plans, especially to avoid using forest land (particularly natural forests), mining areas and mineral reserves (like titanium).

- Land utilization efficiency of the proposed project.
- Financial capacity and experience of the Investor proposing wind power project.

III. Update the orientation of Vietnam's national energy development strategy to 2030, with a vision to 2045 related to wind power and review the scale of wind power development in line with planning milestones

III.1. Update the orientation of Vietnam's national energy development strategy to 2030, with a vision to 2045 related to wind power development

On February 11, 2020, the Politburo issued Resolution No. 55-NQ/TW on the orientation of Vietnam's National Energy Development Strategy to 2030, with a vision to 2045 (Resolution 55), which clearly states actual situation and causes; directing viewpoints, goals and visions; key tasks and solutions for the energy sector. This is a guideline for agencies, socio-political organizations and stakeholders for coordination and implementation.

Regarding the renewable energy sector, Resolution 55 has given some important guidelines as follows:

1. Directing viewpoints: "... give priority to thoroughly and efficiently exploiting and using renewable, new and clean energy sources".

2. Major tasks and solutions: "Develop breakthrough mechanisms and policies to encourage and promote the strong development of renewable energy sources in order to replace fossil energy sources to the largest possible extent. Prioritize the development of wind and solar energy for power generation. Establish and develop a number of renewable energy centers in regions and localities possessing competitive edges"; "Encourage development of rooftop and floating solar power. Develop breakthrough policies and mechanisms for offshore wind power development in association with the implementation of the Vietnam Sea Strategy".

III.2. Calculating the development scale of wind power to 2025 and 2030

Updated progress of power sources according to the revised PDP VII shows that most of the thermal power sources are 1-2 years behind schedule, especially the Southern coal thermal power sources expected in 2018-2021 such as Long Phu I, Hau River, Hau River II; Long Phu III; O Mon III, IV thermal power plants and gas-fired power plants from Blue Whale field are likely to be behind schedule due to the inability to determine the exact arrival time of gas from Block B and Blue Whale field. In addition, Vietnam has decided to stop investing in Ninh Thuan nuclear power plant until 2030. Demand-supply calculations also need to show possibility of power shortage in the Southern power system, therefore it is necessary to take into account additional new sources of electricity to ensure the national power supply.

Many approaches have been proposed by investors to develop power sources to ensure the supply-demand balance in the coming period: developing renewable energy sources (especially wind and solar energy); importing electricity from neighboring countries; accelerating the generation of thermal power sources and adding new thermal power sources, especially LNG-fired projects being proposed.

According to the revised PDP VII, prepared by the Institute of Energy in February 2020, the capacity of power sources to ensure the supply-demand balance for the baseline scenario and aspiration scenario until 2030 is expected as follows:

Table 1: Power source structure in the period of 2021 - 2030, baseline scenario

Category/Year	**Installed capacity (MW)**			**Capacity structure (%)**		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**
Total power demand nationwide	**42080**	**63471**	**90651**			
Total installed capacity of the power source	**59090**	**104824**	**145568**			
Total installed capacity (non-wind, solar, and power storage)	***51410***	***81944***	***110028***			
Proportion of contingency (excluding wind, solar and power storage)	***22.2%***	***29.1%***	***21.4%***			
In which:						
Coal-fired thermal power	19637	38842	48932	33.2%	37.1%	33.6%
Gas-fired thermal power generated domestically + imported from Malaysia	7133	10514	10774	12.1%	10.0%	7.4%
New LNG-fired power	0	1500	12750	0.0%	1.4%	8.8%
Current thermal power switching to LNG	0	1883	4213	0.0%	1.8%	2.9%
Oil-fired thermal power	1610	575	108	2.7%	0.5%	0.1%
Import	920	3370	5796	1.6%	3.2%	4.0%
Large-scaled hydropower of over 30 MW	17766	19116	19211	30.1%	18.2%	13.2%
Small-scaled hydropower	3800	4900	6000	6.4%	4.7%	4.1%
Wind power (*)	1010	6030	10090	1.7%	5.8%	6.9%
Solar power (*)	6670	14450	20050	11.3%	13.8%	13.8%
Biomass and other renewable energies	544	1244	2244	0.9%	1.2%	1.5%
Power storage (Hydropower storage + battery storage)	0	2400	5400	0.0%	2.3%	3.7%

Table 2: Power source structure in the period of 2021 - 2030, aspiration scenario

Category/Year	Installed capacity (MW)			Capacity structure (%)		
	2020	**2025**	**2030**	**2020**	**2025**	**2030**
Total power demand nationwide	**44224**	**68367**	**100215**			
Total installed capacity of the power source	**60090**	**116699**	**169498**			
Total installed capacity (non-wind, solar, and power storage)	***51410***	***82319***	***120458***			
Proportion of contingency (excluding wind, solar and power storage)	**16.2%**	**20.4%**	**20.2%**			
In which:						
Coal-fired thermal power	19637	38842	52962	32.7%	33.3%	31.2%
Gas-fired thermal power generated domestically + imported from Malaysia	7133	10139	10024	11.9%	8.7%	5.9%
New LNG-fired thermal power	0	1500	18000	0.0%	1.3%	10.6%
Current LNG-fired thermal power	0	2258	5063	0.0%	1.9%	3.0%
Oil-fired thermal power	1610	950	108	2.7%	0.8%	0.1%
Import	920	3370	5796	1.5%	2.9%	3.4%
Large-scaled hydropower of over 30 MW	17766	19116	19211	29.6%	16.4%	11.3%
Small-scaled hydropower	3800	4900	6000	6.3%	4.2%	3.5%
Wind power (*)	1010	11630	18390	1.7%	10.0%	10.8%
Solar power (*)	7670	20350	25250	12.8%	17.4%	14.9%
Biomass and other renewable energies	544	1244	2544	0.9%	1.1%	1.5%
Power storage (Hydropower storage + battery storage)	0	2400	5400	0.0%	2.1%	3.2%

(*) Wind and solar power are fit in at a surging rate in volume in the period 2021-2023 to ensure power supply due to delays with thermal power projects.

With the size of the power sources as above, by 2025: About 6,030MW of wind power needs to be added to the PDP under the baseline scenario and 11,630MW under the aspiration scenario.

The aspiration scenario can be considered as an operating plan to develop sufficient power reserve in case of increased power loads, adverse climatic conditions or delays with other power sources.

IV. Update the progress of addition to the PDP and propose to add wind power projects

IV.1. Wind power projects added to the PDP and put into operation

The total capacity of wind power projects approved for inclusion in the PDP

is about 4,800 MW, expected to be operational between now and 2021, mainly in the South West and South Central regions. However, out of the 4,800MW being added to the PDP, only nine wind power projects have been put into operation with a capacity of 350MW.

IV.2. Projects currently proposed for addition to the PDP

As at March 15, 2020, in addition to projects that have been added to the PDP, the Ministry of Industry and Trade has received proposals from provincial People's Committees for a total of nearly 250 wind power projects with a total capacity of about 45,000 MW, specifically broken down by region/geographic area as follows:

1. North Central Coast (provinces proposing to add wind power include Ha Tinh, Quang Binh and Quang Tri): The total number of projects proposed by the PPCs for addition in PDP is 51, with a total capacity of 2,919 MW.

2. The South Central Coast region (provinces proposing to add wind power include Binh Dinh, Phu Yen, Ninh Thuan and Binh Thuan): The total number of projects proposed by the PPCs for addition in PDP is 10, with a total capacity of 4,193 MW (if excluding Thang Long Wind offshore project, it's 793 MW).

3. The Central Highlands region (provinces proposing to add wind power include Kon Tum, Gia Lai, Dak Lak, Dak Nong and Lam Dong): The total number of projects proposed by the PPCs for addition in PDP is 91, with a total capacity of 11,733.8 MW.

4. The South East region (the province proposing to add wind power is Ba Ria - Vung Tau): The total number of projects proposed by the PPCs for addition in PDP is 2, with a total capacity of 602.6 MW.

5. The South West region (provinces proposing to add wind power include Tien Giang, Ben Tre, Tra Vinh, Hau Giang, Soc Trang, Bac Lieu and Ca Mau): The total number of projects proposed by the PPCs for addition in PDP is 94, with a total capacity of 25,541 MW.

Summary of the number of projects and capacity scale for each region and each province is shown in Appendix 1.

V. Proposed scale of wind power capacity to be added to the PDP by 2025

According to the calculations of the Institute of Energy above, the wind power capacity that needs to be added to the PDP by 2025 in the baseline scenario is about 6,030MW, and in aspiration scenario is 11,630MW.

The total capacity of wind power already added to the PDP is 4,800MW. Therefore, the wind power capacity to be added by 2025 is about 1,230MW under the baseline scenario and 6,830MW under the aspiration scenario.

With the guiding principles set forth in the Politburo's Resolution 55 above, wind energy development should be promoted as one of the key and appropriate

directions. On the other hand, the risk of short-term power shortage (during the period 2021 - 2024) is real whereas large thermal power projects continue to be behind schedule or the schedule has not been determined yet, the load may increase, and climate conditions may worsen. Therefore, it is recommended to select an aspiration scenario for developing wind power.

VI. Good responsiveness of the power infrastructure for provinces proposing to add wind power projects

The calculations of the Institute of Energy (February 2020) on the responsiveness of the regional power grid (especially in the North Central, Central Highlands, South Central and South Western regions) until 2025 show that:

V.1. In the North Central region

Currently, Quang Tri province has 16 wind power projects with a total capacity of 638 MW already approved to be included in the PDP; and is proposing to add another 2,612 MW of wind power. All of the above projects are concentrated in the mountainous area to the West of Quang Tri and are proposed to be put into operation before November 2021.

Calculation results show that the regional 110-220kV power system satisfies quite well the need to release the capacity of the local power sources in normal operation mode. However, given the incident with one of the 2 transformers of 220kV Lao Bao substation (2x250MVA), the other device has been overloaded. Release limit of the incremental wind power in Quang Tri is about 570 MW (in normal operation mode).

Ha Tinh and Quang Binh provinces, each province has 01 proposed project, namely HBRE Ha Tinh Wind Farm Project with a capacity of 120MW and B&T Wind Farm (Quang Binh) with a capacity of 252MW, and their power grid is capable of accommodating such additional capacity.

Therefore, the total capacity of wind power that can be added to the PDP in this area is about 941MW. The list of projects that can release capacity is shown in Appendix 2.

V.2. In the South Central region

Binh Dinh and Phu Yen also house many solar power projects and are currently proposing to add 04 wind power projects to the PDP (with a total capacity of 331 MW). Calculations show that it is difficult to add these wind power projects due to weak capacity of the 220kV power grid here.

Ninh Thuan and Binh Thuan areas have the highest growth rate of renewable energy resources in the country. In the last 2 years 2018-2019, about 2,391 MW of solar power and 200 MW of wind power have been put into operation in this area. In addition, about 1,000 MW of wind power and nearly 600 MW of solar power have been added to the PDP, but not yet been operational. In addition, 450MW Trung Nam Solar Power Plant has just been added to the PDP (joining the power grid through 500kV Thuan Nam Substation).

Binh Thuan province has proposed to supplement Thang Long Wind power project (in Ke Ga) to the PDP. This is an offshore wind power project with a capacity of 3,400 MW, to be operated in the period 2022 - 2027, so it has not been included in the supply-demand balance, since only wind power sources put into operation before November 2021 will be taken into account.

Calculations made for wind power projects in Ninh Thuan province, at the end of 2021 show that only when the whole transmission grid works approved for inclusion in the PDP by the Prime Minister (Document No. 1891/TTg-CN dated December 27, 2018) are put into operation (especially 500kV Thuan Nam substation and connection lines), and, at the same time, the 220kV Di Linh - Duc Trong line is separated, the regional power grid is only capable of absorbing an additional capacity of 340MW of wind power sources and Trung Nam solar power plant (Thuan Nam) (in the normal operation mode).

The list of projects that can release the area's capacity is shown in Appendix 3.

V.3. In the Central Highlands region

Up to now, the area has 13 wind power projects with a total capacity of 368MW already approved for addition to the PDP and is proposing to add another 11,733.8 MW. Among these, about 71.3% of capacity (8,368MW) comes from wind power projects located in Gia Lai province, followed by Dak Lak (2,683MW) accounting for 23%, and Dak Nong (460MW) accounting for 3.9 %. Kon Tum and Lam Dong provinces only proposes to add 1-2 projects to the PDP, with a capacity of 153.5 MW and 69 MW respectively.

Calculation results show that, in the case of extreme operation (during noon in flood seasons, the Central Highlands plants all run at full capacity), even in normal operation mode, 500kV Pleiku 2 substation (2x450MVA) and 500kV Dak Nong (2x450MVA) operate at full load. Thus, the current projects that have been added to the PDP already pose a challenge on operation of the regional power system by 2021.

In order to consider the additional capacity of the region's wind power by 2021, it is proposed to consider the following options:

1. Option 1: Renovate and raise the capacity of Dak Nong 500kV and Pleiku 2 substations to 2x900MVA:

If Dak Nong 500KV substation and Pleiku 2 500KV substation are allowed to increase capacity to 2x900MVA in 2021, the regional power grid can accommodate about 1,150 MW of wind power.

2. Option 2: Renovate and raise the capacity of Dak Nong 500kV and Pleiku 2 substations to 2x900MVA; Build a new 220kV line of 41km length connecting Chu Se to Pleiku 2:

If circuit 2 of the Pleiku 2 - Chu Se 220kV transmission line of about 41km length (cross section of AC500 or 2xAC330) can be accelerated, it is possible to

release about 250MW of additional capacity, increasing the total incremental capacity in Gia Lai and Dak Lak to about 1,400MW at 220kV grid level. The Pleiku 2 - Chu Se transmission line is part of circuit 2 of Pleiku 2- Krong buk line already included in the PDP (2016-2020), its Feasibility Study Report is currently being finalized. Therefore, in order to accelerate this line, it is necessary to take appropriate measures to ensure the coordinated operation progress with wind power projects in 2021.

In case circuit 2 of Doc Soi - Quang Ngai 220kV line is operated in 2021, about 200MW of wind power can be released in the area of Gia Lai province.

Projects connected to the 500kV power grid (such as the Ia Pet - Dak Doa wind power project, with a capacity of 200MW; Ia Nam wind power project, with a capacity of 400MW) can release their capacity. Projects need to be combined in groups to take advantage of the shared grid infrastructure.

The list of proposed projects is shown in Appendix 4.

V.4. In the South West region

1. Currently, the region has 32 wind power projects already included in the PDP with a total capacity of about 2,000MW. If taking into account the approved power grid up to the end of 2021, the power grids of Ben Tre, Tra Vinh and Ca Mau provinces are capable of releasing the additional sources. In particular, in Soc Trang and Bac Lieu provinces, it is necessary to consider renovating some 110kV lines (to be operated in 2021) instead of the period 2026-2030 as the provincial power development plan.

Under such conditions, the total additional capacity of wind power that can be released is about 2,300MW.

2. In case additional investment is made in some 110 kV lines

Proposed 110kV grid projects:

- Build circuit 2 of Ben Tre 110 kV and Ben Tre 220 kV of 0.24 km length, cross section of ACSR-2x240.

- Build circuit 2 of Ba Tri - Giong Trom 110 kV of 16 km length, cross section of ACSR-2X185.

- Build a double-circuit 110 kV transmission line from Ben Tre 220 kV substation to My Tho 220 kV substation of 15 km length, cross section of ACSR-2x240.

With the investment in the above lines, it is possible to release more 755MW (concentrated in Ben Tre).

3. If some projects are added to the PDP for joining 220kV grid

Proposed 220kV grid projects:

- Build a double-circuit 220 kV line of about 5 km length, the cross section of ACSR- 400 for transit connection through Bac Lieu 220 kV substation to existing 220 kV Ca Mau - Soc Trang thermal power line (single circuit,

ACSR-795MCM equivalent to ACSR-400). This 220 kV transmission line is not currently included in the revised PDP VII and Bac Lieu power development plan.

- Add 2 more 220 kV bays at Bac Lieu 220 kV substation (at present, preliminary assessment shows that the addition of bays is quite challenging).

After these proposed solutions are implemented, in normal operation mode, the 220 kV grid can only release an additional capacity of 200 MW from the wind power projects connected to the 220 kV Gia Rai - Bac Lieu line.

The list of projects that can release the area's capacity is shown in Appendix 5.

V.5. In the South East region

In the South East region, only Ba Ria - Vung Tau province proposed to add 2 projects to the PDP: Cong Ly Project in Ba Ria Vung Tau, with a capacity of 102.6MW (near shore) and HBRE Ba Ria - Vung Tau Project, with a capacity of 500MW (offshore).

The list of projects that can release the South East region's capacity is shown in Appendix 6.

V.6. Summary

Combining the above calculations and analyses, by 2021, the power grid (with some proposals of renovation, acceleration and addition of some projects to the PDP) can absorb about 7,000 MW (in normal operation mode).

This capacity is quite consistent with the incremental wind power capacity of the aspiration scenario (adding about 6,830 MW), taking into account contingencies when the progress of implementing some power source and grid projects does not meet the requirements.

VII. Proposed addition/acceleration of transmission grid projects to release wind power projects

Above calculations and analyses show that a number of transmission grid projects need to be added to the PDP or accelerated to release wind power projects, specifically as follows:

1. Raise the capacity of Dak Nong 500kV substation from 2x450MVA to 2x900MVA.

2. Raise the capacity of Pleiku 2 500kV substation from 2x450MVA to 2x900MVA.

3. Build a new 220kV Bac Lieu - Ca Mau - Soc Trang transmission line, of 5 km length.

4. Accelerate Binh Dai 220 kV substation and double-circuit Binh Dai - Ben Tre 220 kV transmission line from 220 kV substation (250 MVA; 2x50 km), originally planned for the 2031-2035 period, to 2021-2025 period.

VIII. Recommendation:

With the above analyses, in a context where the deadline for October 31, 2021 (for wind power projects to be entitled to mechanisms set forth under Decision No. 39/2018/QD-TTg) is nearing, to ensure publicity, transparency and effectiveness of the Government's policies to encourage the development of renewable energy sources (especially wind power), effectively contribute to increasing the national power supply, and implement the Politburo's Resolution 55 as well as Vietnam's C02 emission reduction objectives in COP21 of the United Nations Framework Convention on Climate Change (UNFCCC), the Ministry of Industry and Trade would like to propose the Prime Minister to:

1. Approve the principle to adjust the wind power development target until 2025 with a capacity of 11,630 MW to ensure power supply and backup power source in case of high load, adverse climate conditions or delays with other sources.

2. Consider to supplement the proposed wind power projects to the PDP with connection plan and capacity release conditions being presented in the list in Appendices 2-6 attached.

3. Consider to supplement or accelerate power grid projects (mentioned in Section VI) in a coordinated manner to release the capacity of wind power projects in the proposed list.

4. Assign People's Committees of provinces having wind power projects to urgently review land use master plans and other master plans under their mandate to carry out procedures for land use purpose alteration for renewable energy projects already added to the PDP, giving priority to the areas of low economic value and high potential for developing renewable energy.

5. Assign the Ministry of Industry and Trade to coordinate with the People's Committees of the provinces and cities in accelerating and supervising power source from renewable energy, especially wind power, which have been added to the PDP. In case the projects are not implemented as approved, such approval will be revoked to avoid affecting other projects under review for addition to the PDP and connection to the national power system.

6. Request EVN to direct its affiliated units to urgently invest in the coordinated power grid projects to release capacity of wind power projects.

7. Wind power projects that have not been supplemented to the PDP in this period will continue to be considered, studied and appraised for later inclusion in the revised PDP VII if they are eligible or for future inclusion in PDP VIII.

The Ministry of Industry and Trade would like to seek the Prime Minister's instructions for implementation./.

Recipient(s):
- As above;

ON BEHALF OF THE MINISTER
VICE MINISTER

- Deputy Prime Minister Trinh Dinh Dung (for reporting);
- Office of the Government;
- Minister (for reporting);
- Institute of Energy;
- Vietnam Electricity;
- Filing: Admin., ERAV (Planning and International Cooperation).

Stamp: [BỘ CÔNG THƯƠNG - MINISTRY OF INDUSTRY AND TRADE]

[Signature]

Hoang Quoc Vuong

Appendix 1: Combined capacity of wind power projects proposed for addition to the PDP by region, province or city

Table 1. Combined capacity of wind power projects proposed for addition to the PDP by region

No.	Region	Number of projects	Capacity (MW)
1	North Central	51	2,918.8
2	South East	2	602.6
3	South Central	10	4,193.1
4	South West	94	25,540.9
5	Central Highlands	91	11,733.8
	Total	**248**	**44,989.1**

Table 2. Combined capacity of wind power projects proposed for addition to the PDP by province or city

No.	Province	Number of projects	Capacity (MW)
1	Ba Ria - Vung Tau	2	602.6
2	Bac Lieu	19	4,608.6
3	Ben Tre	23	12,063.0
4	Binh Dinh	3	225.0
5	Binh Thuan	1	3,400.0
6	Ca Mau	16	4,249.0
7	Dak Lak	23	2,683.4
8	Dak Nong	6	460.0
9	Gia Lai	59	8,368.0
10	Ha Tinh	1	120.0
11	Hau Giang	1	100.0
12	Kon Tum	2	153.5
13	Lam Dong	1	68.9
14	Ninh Thuan	5	462.1
15	Phu Yen	1	106.0
16	Quang Binh	1	252.0
17	Quang Tri	49	2,546.8
18	Soc Trang	19	1,748.8
19	Tien Giang	2	685.5
20	Tra Vinh	14	2,086.0
	Total	**248**	**44,989.1**

Appendix 2: List of wind power projects in the North Central region proposed for addition to the PDP

No.	Name of project	Capacity (MW)	District	Province	Connection plan	Conditions for capacity release
1	Huong Linh 5 Wind Power Plant	30	Huong Hoa	Quang Tri	Connect to 22kV busbar of the 22/110kV substation of Huong Linh 4 Wind Power Plant	In normal operating mode (N-0)
2	Huong Hiep 2 Wind Power Plant	30	Huong Hoa	Quang Tri	Connect to 110kV busbar of Huong Linh 110/220kV substation (capacity gathering substation in Huong Linh and surrounding areas), then transmit via 220kV line to 220kV busbar of Lao Bao 220kV substation	
3	Huong Hiep 3 Wind Power Plant	30	Huong Hoa	Quang Tri	Connect to 22kV busbar of 22/110kV substation of Huong Hiep 2 Wind Power Plant, then transmit capacity on 110kV line to 110kV busbar of Huong Linh 110/220kV substation (capacity gathering substation in Huong Linh area)	
4	Quang Tri TNC 1 Wind Power Plant	50	Huong Hoa	Quang Tri	Connect 220 kV from single-circuit 220 kV Huong Tan substation, 300 mm2 wire, 7km long	
5	Quang Tri TNC 2 Wind Power Plant	50	Huong Hoa	Quang Tri		
6	Huong Linh 7	30	Huong Hoa	Quang Tri	Connect to the 22/110kV busbar of Gelex 3 Wind Power Plant	
7	Huong Linh 8	25.2	Huong Hoa	Quang Tri	Connect to the 22/110kV busbar of Gelex 3 Wind Power Plant	
8	AMACCAO Quang Tri Wind Power Plant	50	Huong Hoa	Quang Tri	Connect to 110kV busbar of Lao Bao 110kV substation	
9	Tan Hop Wind Power Plant	38	Huong Hoa	Quang Tri	Connect to 110kV busbar of Lao Bao	

No.	Name of project	Capacity (MW)	District	Province	Connection plan	Conditions for capacity release
					110kV substation	
10	Huong Hoa Thermal Power Plant 1	48	Huong Hoa	Quang Tri	Connection of LIG Huong Hoa 1 Wind Power Plant by 220kV voltage level into the 220 kV busbar of Lao Bao 220kV substation , ACSR300, about 3.5 km long. Expansion and investment in construction 01 220kV outgoing bay in Lao Bao 220kV substation	
11	LIG Huong Hoa 2 Wind Power Plant	48	Huong Hoa	Quang Tri		
12	Hai Anh	40	Lao Bao	Quang Tri	Single-circuit 110 kV transmission line connected to 110 kV busbar of Lao Bao 220 kV substation, 240 mm2 wire, 2 km long	
13	Tai Tam Wind Power Plant	50	Huong Hoa	Quang Tri	Connect with 220kV line to Lao Bao 220kV substation	
14	Hoang Hai Wind Power Plant	50	Huong Hoa	Quang Tri	Build a 22/220kV substation to connect to 220kV busbar of Lao Bao 110kV substation	
15	HBRE Ha Tinh Wind Farm	120	Ky Anh district and Ha Tinh town	Ha Tinh	Transit connection on Ky Anh-Ha Tinh 110 kV line	
16	B&T Wind Farm	252	Quang Ninh; Le Thuy	Quang Binh	Transit connection on Dong Hoi - Dong Ha 220 kV line through two 220 kV booster stations	
	Total	**941.2**				

Appendix 3: List of wind power projects in the South Central region proposed for addition to the PDP

No.	Name of project	Capacity (MW)	District	Province	Connection plan	Conditions for capacity release
1	7A Wind Power Project	50	Thuan Nam	Ninh Thuan	Double-circuit 1l0kV transmission line to 110kV busbar of Ninh Phuoc 220kV substation, AC300, 12km long	- In normal operating mode (N-0) - After the power grid works to release renewable energy capacity that have already been added to the plan are put into operation, especially Thuan Nam 500kV substation and Thuan Nam - Vinh Tan 500kV substation. - Separate Di Linh - Duc Trong 220kV transmission line
2	Dam Nai 4 Wind Power Project	27.6	Thuan Bac	Ninh Thuan	Connect to 110kV busbar of Thap Cham 220kV substation, AC300 wire, 2km long	
3	Loi Hai 2	28.9	Thuan Bac	Ninh Thuan	Transit connection on Thap Cham - Cam Thinh Dong line, double-circuit, 25m long, cross section AC240	
4	Dam Nai 3 Wind Power Project	39.4	Thuan Bac	Ninh Thuan	Connect to 110kV busbar of Dam Nai 4 Wind Power Plant substation, AC240, 1.8km long	
5	Wind Power Project No. 5 Ninh Thuan	46.2	Ninh Phuoc	Ninh Thuan	220kV single-circuit line connected to 220kV busbar of Ninh Phuoc 220kV substation, AC330, 2km long	
6	Cong Hai 1 Wind Power Project - Phase 2	25	Thuan Bac	Ninh Thuan	Transit connection on 110kV Ninh Hai - South Cam Ranh with double-circuit line of 800m length and 2xAC240 phase separation line	
7	Phuoc Huu - Duyen Hai 1 Wind Power Project	30	Ninh Phuoc	Ninh Thuan	Transit connection on circuit 2 of Thap Cham - Ninh Phuoc line	

No.	Name of project	Capacity (MW)	District	Province	Connection plan	Conditions for capacity release
8	Vietnam Power No. 1 Wind Power Project	30	Thuan Nam	Ninh Thuan	Connect to 7A Wind Power Project	
9	BIM Wind Power Project	88	Thuan Nam	Ninh Thuan	Connect to 220kV busbar of Vinh Tan 500kV substation through single-circuit 220kV line, 2xACSR300, 22km long	
	Total	**336.2**				

Appendix 4: List of wind power projects in the Central Highlands region proposed for addition to the PDP

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
1	Ea H'leo 1,2	57	Ea H'leo	Dak Lak	Connect single circuit 110 kV to Ea H'leo 110kV Substation; AC240; 13 km long	- In normal operating mode (N-0) - Raise the capacity of Dak Nong 500kV substation and Pleiku 2 500kV substation to (2x900) MVA in 2021
2	Ea Nam	400	Ea H'leo	Dak Lak	Build a new 500kV-450MVA substation for transit connection on the Pleiku - Di Linh 500kV line	
3	Đak Hoa Wind Power Project	50	Dak Song	Dak Nong	220 kV line's transit connection on Dak Nong - Buon Kuop 220 kV line, AC2x330, 2km long	
4	Cuu An	46.2	An Khe	Gia Lai	Build 110kV booster substation and 100kV transmission line, AC185, transit connecting on An Khe - K'Bang, 0.5km long	
5	Song An	46.2	An Khe	Gia Lai	Song An 110kV Wind Power Plant Substation, 2x52MVA, transit connect to 1 circuit of An Khe - K'Bang 110kV line	
6	Cho Long Wind Power Project	155	Kong Chro	Gia Lai	Build a 220kV booster station at Yang Trung Wind Power Plant, transit connecting on Pleiku 2 220kV line - An Khe Hydropower Plant (jointly invested with Yang Trung Wind Power Plant)	- In normal operating mode (N-0) - Circuit 2 of Doc Soi - Quang Ngai 220 kV line operating synchronously with these wind power sources - Raise the capacity of Dak Nong 500kV substation and Pleiku 2 500kV substation to (2x900) MVA in 2021
7	Yang Trung Wind Power Plant	145	Kong Chro	Gia Lai	35/220kV of Yang Trung Wind Power Plant transit connects to 1 circuit of 220kV An Khe Hydropower Plant - 500kV Pleiku 2	
8	Hung Hai Gia Lai	100	Kong Chro	Gia Lai	Transit connection on Pleiku 2 220kV line - An Khe Hydropower Plant (transit connect to Phuoc An)	
9	Cu Ne 1	50	Krong Buk	Dak Lak	Gather capacity of Cu Ne 1,2 Wind Power	- - In normal operating mode (N-0)

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
10	Cu Ne 2	50	Krong Buk	Dak Lak	Plants + Krong Buk 1,2 Wind Power Plants to 22/220kV booster station of Krong Buk Wind Power Plant, 2xl25MVA, transit connecting on Krong Buk - Pleiku 2 220kV line	- Circuit 2 of Pleiku 2 - Chu Se 220kV line came into operation - Raise the capacity of Dak Nong 500kV substation and Pleiku 2 500kV substation to (2x900) MVA in 2021
11	Krong Buk 1	50	Krong Buk	Dak Lak		
12	Krong Buk 2	50	Krong Buk	Dak Lak		
13	Ia Le Wind Power Project	100	Chu Puh	Gia Lai	Build a 220kV booster station with a capacity of 2xl25MVA and double-circuit line, AC500, 6km long connecting to Chu Se 220kV substation	
14	Nhon Hoa 1,2 Thermal Power Plants	100	Chu Puh	Gia Lai	35/220kV substation of Nhon Hoa 1 Wind Power Plant transit connects to 1 circuit of Krong Buk 220kV - Pleiku 2 500kV line	
15	Asia Đak Song 1 Wind Power Project	50	Dak Song	Dak Nong	Double-circuit 110 kV line's transit connection on Dak Nong - Buon Kuop 110 kV line, AC240, 0.5km long	- In normal operating mode (N-0) - Raise the capacity of Dak Nong A 500kV substation and Pleiku 2 500kV substation to (2x900) MVA in 2021
16	Central Highlands Processing Wind Power Project	50	Chu Prong	Gia Lai	Connect 22 kV to the Mountainous Area Development project	
17	Wind Power for Mountainous Area Development project	50	Chu Prong	Gia Lai	Transit connection on Dien Hong - Chu Se 110 kV line; phase separation line 2xAC185; 5.2km long	
18	Ia Pech	50	la Grai	Gia Lai	Transit connection on the Grai - Pleiku 110kV line, 4km long	
19	Ia Pech 2 wind power project	50	la Grai	Gia Lai		
20	Ia pet Dak Doa	200	Dak Doa	Gia Lai	Separate 500kV Transformer, connecting to Pleiku 2 500kV substation	
21	Kon Plong	103.5	Kon Plong	Kon Tum	Kon Plong Wind Power Plant 220kV booster	

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
					station with a capacity of 150MVA-35/220KV, connected by a double circuit 220kV line, ACSR 330, 19km long, transit connecting on 220kV transmission line of Upstream Kon Tum - Quang Ngai Hydropower Plant	
22	Tan Tan Nhat	50	Dak Glei	Kon Tum	Connecting to Bo Y 110kV substation	
23	Dak ND'rung 1	100		Dak Nong	Connecting to 220kV busbar of Dak Nong 220kV substation	
24	Dak ND'rung 2	100	Dak Song	Dak Nong		
25	Dak ND'rung 3	100		Dak Nong		
26	Nam Binh 1 Wind Power Project	30	Dak Song	Dak Nong	Connect 110kV to the 220kV gathering station in Dac Hoa Wind Power Plant, transit connecting on 220kV line of Buon Kuop aluminum electrolysis plant	
27	Ia Bang 1 wind power project	50	Chu Prong	Gia Lai	Connecting to Dien Hong 110kV substation with a single circuit 110kV line of about 30km length	
28	Ia Boong - Chu Prong	50	Chu Prong	Gia Lai	Connect with 220kV line to Pleiku2 500kV substation	
	Total	2432.9				

Appendix 5: List of wind power projects in the South West region proposed for addition to the PDP

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
1	Dong Hai 1 Wind Power Project - phase 2	50	Dong Hai	Bac Lieu	Connect to 220 kV ECOTECH Dong Hai gathering substation which is connected to 220 kV busbar - Duyen Hai 500kV substation via double-circuit 220 kV line	The connection plan depends on the progress of Hoa Binh 110 kV substation provided that the operation schedule of Hoa Binh 110 kV cutting station is coordinated with power sources.
2	Hoa Binh 1 Wind Power Project - phase 2	50	Hoa Binh	Bac Lieu	Connect to the site of Hoa Binh 1 Wind Power Project - phase 1 (connect to Hoa Binh 110 kV substation via double-circuit 220 kV transmission line)	- In normal operating mode (N-0)
3	Hoa Binh 2 Wind Power Project	50	Hoa Binh	Bac Lieu	Connect to Hoa Binh 110 kV switching station (at the site of Hoa Binh 220 kV substation) via double-circuit 220 kV transmission line	The connection plan depends on the progress of Hoa Binh 110 kV switching station, provided that the operation schedule of Hoa Binh 110 kV switching station is coordinated with power sources.
4	Hoa Binh 5	120	Hoa Binh District	Bac Lieu	Double-circuit 220 kV transmission line used in conjunction with Bac Lieu HCG Wind Power Plants - Gia Rai - Bac Lieu 2 220 kV transmission line	It is necessary to accelerate the construction of new double-circuit 220 kV transmission line to connect Bac Lieu 220 kV substation, transition on 220 kV line of Ca Mau - Soc Trang Thermal Power Project (Planning: 2026-2030).
5	Sunpro Wind Power Project	30	Binh Dai	Ben Tre	Connect to Binh Dai 110 kV substation via double-circuit 110 kV transmission line	It is necessary to separate the operation of Ben Tre 110 kV and Ben Tre 220 kV transmission lines.
6	Thien Phu Wind Power Project	30	Thanh Phu	Ben Tre	Gather to 110 kV switching station and connect to Binh Thanh 110 kV substation via double-circuit 110 kV transmission line	It is necessary to separate the operation of Ben Tre 110 kV and Ben Tre 220 kV transmission lines.
7	Thien Phu 2 Wind	30	Thanh Phu	Ben Tre		

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
	Power Project					
8	Wind Power Project No. 5 Ben Tre (phase 2)	90	Thanh Phu	Ben Tre	Including Wind Power Project no. 5 - Thanh Hai 1, 2, 3, 4: 3x30+20 MW; GDI - Wind Power Project no. 5 - Thanh Hai 1 (Vl-2: 30 MW) connected with Vl-1 to Thanh Phu 110 kV substation (Binh Thanh) via double-circuit 110 kV AC240 transmission line	Renovate Mo Cay 110 kV transmission line, Binh Thanh 220 kV transmission line or newly construct Ba Tri - Binh Thanh 110 kV transmission line
9	Hai Phong Wind Power Project	200	Thanh Phu	Ben Tre	35/220 kV substation: 2x250 MVA; 220 kV transmission line to Mo Cay 220 kV substation, 2x50km in length, ACSR-2x500	It is necessary to construct a relatively long 220 kV transmission line (50 km). To ensure the operation, power generation should be decreased by 200 MW. Renovate Ben Tre - My Tho 220 kV transmission line to super-heating wire
10	Thanh Phu Wind Power Project	120	Thanh Phu	Ben Tre	Connect to Binh Thanh 110kV substation via single circuit 110kV transmission line	-Build circuit 2 of Ben Tre 110 kV and Ben Tre 220 kV of 0.24 km length, cross section of ACSR-2x240. -Build circuit 2 of Ba Tri - Giong Trom 110 kV transmission line of 16 km in length, cross section of ACSR-2x185. -Build a double-circuit 110 kV transmission line from Ben Tre 220 kV substation to My Tho 220 kV substation of 15 km in length, cross section of ACSR-2x240. -(These projects have not been supplemented in the planning)
11	Nexif Ben Tre phase 2, 3	50	Thanh Phu	Ben Tre	Newly install 22/110 kV substation: 63 MVA into Nexif Ben Tre Phase 1 110 kV substation (V1-1-30MW) which has been approved; connected with Vl-1 to Binh Thanh 110 kV substation	
12	Bao Thanh Wind Power Project	50	Ba Tri	Ben Tre	22/110 kV substation: 63 MVA; single circuit 110 kV transmission line of 10km in length, AC240 to BaTri 110 kV station	
13	Wind Power Project No. 19 Ben Tre	50	Thua Duc	Ben Tre	Transmission via single circuit 35 kV transmission line to 35kV switching station of 35/220 kV substation of Wind Power	

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
					Project No. 20 Ben Tre	-Accelerate Binh Dai 220 kV substation and double-circuit Binh Dai - Ben Tre 220 kV transmission line from 220 kV substation (250 MVA; 2x50 km), originally planned for the 2031-2035 period, to 2021-2025 period.
14	Wind Power Project No. 20 Ben Tre	50	Thua Duc	Ben Tre	35/220 kV substation: 2x63 MVA; single circuit 220 kV transmission line to Ben Tre 220 kV substation for capacity transmission of Wind Power Project No. 19, 20	
15	Ben Tre VPL - Phase 2	30	Binh Dai	Ben Tre	Gather Ben Tre VPL - Phase 1-2, Binh Dai, Binh Dai 2, Binh Dai 3 to 110 kV busbar; then connect to Binh Dai 110 kV substation via double-circuit 110 kV transmission line of 15 km in length, ACSR-2x240	Implement the solution of building and renovating the 110 kV grid in Ben Tre Province: - Build circuit 2 of Ben Tre 110 kV and Ben Tre 220 kV transmission line of 0.24 km in length, cross section of ACSR-2x240. - Build circuit 2 of Ba Tri - Giong Trom 110 kV transmission line of 16 km in length, cross section of ACSR-2xl85. - Build a double-circuit 110 kV transmission line from Ben Tre 220 kV substation to My Tho 220 kV substation of 15 km long, ACSR-2x240. - Build Giong Trom - Ben Tre double-circuit 110 kV transmission line of 24 km in length, ACSR-2xl85 (These projects have not been supplemented in the planning) - Accelerate Binh Dai 220 kV substation and double-circuit Binh Dai - Ben Tre 220 kV transmission line from 220 kV substation (250 MVA; 2x50 km),
lố	Binh Dai 2 Wind Power Project	49	Binh Dai	Ben Tre		
17	Binh Dai 3 Wind Power Project	49	Binh Dai	Ben Tre		

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
						originally planned for the 2031-2035 period, to 2021 - 2025.
18	Khai Long Wind Power Project phase 2	100	Ngoc Hien	Ca Mau	Gather to 110 kV substation of Khai Long Wind Power Project (connection location of Khai Long Wind Power Project phase 1)	Nam Can 220 kV substation and 220-110 kV **transmission line for station connection**
19	Khai Long Wind Power Project phase 3	100	Ngoc Hien	Ca Mau		
20	Long My 1	100	Long My	Hau Giang	22/220 kV substation: 250 MVA; 220 kV transmission line, transit connection on one circuit of 220 kV transmission line of Ca Mau - O Mon Thermal Power Project, 2x1 km in length, ACSR400	- In normal operating mode (N-0)
21	Soc Trang 4 Wind Power Project	350	Vinh Chau Town	Soc Trang	Connect to Vinh Chau 220 kV substation via double-circuit 220 kV transmission line	Vinh Chau 220 kV substation shall operate prior to October 2021; Accelerate the progress of constructing new double-circuit 220 kV transmission line connecting Bac Lieu 220 kV substation, transiting connection on 220 kV transmission line of Ca Mau - Soc Trang Thermal Power Project, to synchronously operate with these wind power sources
22	Phu Cuong Soc Trang 1A and 1B	200	Vinh Chau	Soc Trang	Connect to Vinh Chau 220 kV substation via double-circuit 220kV transmission line	
23	Soc Trang 16 Wind Power Project	40	Vinh Chau town	Soc Trang	Connect to 110 kV busbar of Soc Trang 110kV substation	
24	Wind Power Project No. 7, Soc Trang phase 2	90	Vinh Chau	Soc Trang	Take advantage of connection infrastructure of Wind Power Project No. 7 - phase 1 - 30 MW (VI-3); install 2 MVA of 22/110 kV:	Vinh Chau 220 kV substation; Vinh Chau - Bac Lieu double-circuit 220 kV transmission line

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
					2x63 MVA	
25	Soc Trang 11 Wind Power Project	100.8	Cu Lao Dung	Soc Trang	Connect to Tran De 110 kV substation	- In normal operating mode (N-0).
26	Hoa Dong 2 Wind Power Project	72	Vinh Chau	Soc Trang	Transit connection on 1 circuit of Vinh Chau - Soc Trang 220 kV transmission line via double-circuit transmission line of 1 km in length	
27	BCG Soc Trang 1 Wind Power Project	50	Vinh Chau	Soc Trang	22/110 kV substation - 63 MVA; single-circuit 110 kV transmission line of 8 km in length to Vinh Chau 220 kV substation, ACSR185	
28	Tran De	50	Tran De	Soc Trang	Single-circuit 110 kV transmission line to Tran De 110 kV switching station of 4 km in length**,** ACSR185	
29	Song Hau	50	Long Phu; Tran De	Soc Trang	Single-circuit 110 kV transmission line to Tran De 110 kV switching station of 4 km in length, ACSR185	
30	Nexif Energy Wind Power Project	40		Soc Trang	Double-circuit 110 kV transmission line to Tran De 110 kV substation of 2x18 km in length, ACSR240	
31	Lac Hoa 2 Wind Power Project	130	Vinh Chau	Soc Trang	Newly construct 220 kV transmission line connecting to 220 kV substation of Hoa Dong 2 Wind Power Project via single-circuit 220 kV transmission line of 6 km in length, ACSR240. Hoa Dong 2 Wind Power Project transits connection on Vinh Chau - Long Phu 220 kV	

No.	Name of project	Capacity (MW)	District	Province	Connection	Conditions for capacity release
					transmission line.)	
32	Dong Thanh 1 Wind Power Project	80	Duyen Hai	Tra Vinh	Gather to Dong Thanh 220 kV substation and transit connection on 1 circuit of ECOTECH Dong Hai 220 kV - Duyen Hai 500 kV transmission line	
33	Dong Thanh 2 Wind Power Project	120	Duyen Hai	Tra Vinh		
34	Dong Hai 1 Wind Power Project	100	Duyen Hai	Tra Vinh	Gather to ECOTECH Dong Hai 220 kV substation then connect to 220 kV busbar - Duyen Hai 500 kV substation via double-circuit 220 kV transmission line of 9 km in length, ACSR-2x330	Implement the solution of building and renovating the 110 kV grid in Ben Tre Province: (4 projects of 110 kV grid as proposed to Ben Tre Province).
35	Thang Long Wind Power Project	96		Tra Vinh	Newly construct single-circuit 220 kV transmission line to connect with 220 kV busbar of Duyen Hai 500 kV substation of 12 km in length, ACSR-400	
36	Tan Phu Dong Wind Power Project	150	Go Cong Dong	Tien Giang	Connect to the existing Go Cong 110 kV substation via double-circuit transmission line of 23 km in length, ACSR185	110 kV My Tho 220 kV - Go Cong - Can Duoc - Can Duoc 220 kV double-circuit transmission line, prior suspension of 1 circuit, 65 km in length, phase separation cross section of ACSR-2x240 must be put into operation (SPC plans to complete this project by the end of 2020)
37	Vien An Wind Power Project	50	Ngoc Hien	Ca Mau	Connect to Nam Can 220 kV substation via single-circuit 220 kV transmission line of 17 km in length, ACSR400	- In normal operating mode (N-0).
	Total	**3166.8**				

Appendix 6: List of wind power projects in the South East region proposed for addition to the PDP

No.	Name of project	Capacity (MW)	District	Province	Connection plan	Conditions for capacity release
1	Cong Ly Ba Ria - Vung Tau	102.6	Xuyen Moc	Ba Ria - Vung Tau	Double circuit 110kV transmission line connected to Xuyen Moc 110kV substation, 21.5km long	- In normal operating mode (N-0)