

## CIRCULAR

### METHODS FOR DETERMINATION OF SOLAR POWER AND WIND POWER GENERATION PRICING FRAMEWORK

*Pursuant to the Government's Decree No. the Government's Decree No. 96/2022/NĐ-CP dated August 29<sup>th</sup> 2022 on functions, tasks, entitlements and organizational structure of the Ministry of Industry and Trade;*

*Pursuant to the Government's Decree No. 137/2013/NĐ-CP dated October 21<sup>st</sup> 2013 elaborating some Articles of Law on Electricity;*

*At request of the Director of Electricity Regulatory Authority of Vietnam;*

*The Minister of Industry and Trade promulgates a Circular on methods for determination of solar power and wind power generation pricing framework*

#### Chapter I

### GENERAL PROVISIONS

#### Article 1. Scope and regulated entities

1. This Circular provides for:

- a) Methods for developing the annual electricity generation pricing framework for ground-mounted solar power plants, floating solar power plants, onshore, inshore and offshore wind power plants;
- b) Procedures for developing and promulgating annual electricity generation pricing framework.

2. This Circular does not apply to solar power plants and wind power plants prescribed in Point b Clause 2 Article 1 of Circular No. 15/2022/TT-BCT dated cot 3<sup>rd</sup> 2022 of the Minister of Industry and Trade on methods for determination of transitional solar power and wind power generation pricing framework, solar power plants and wind power plants having power purchase agreements (PPAs) with Vietnam Electricity (EVN) with effective electricity prices.

3. This Circular applies to:

- a) Vietnam Electricity (EVN);
- b) Organizations and individuals investing in solar power plants and wind power plants;
- c) Other relevant organizations and individuals.

#### Article 2. Definitions

In this Circular, the terms below are construed as follows:

1. "standard solar power plant" means a power plant in which investors are selected on the basis of implementation of the National Electricity Development Planning, with a popular installed capacity, has not entered into any PPA, is representative of ground-mounted and floating solar power plants, and is used for calculation of electricity generation pricing framework for such type of power plant.

2. "floating solar power plant" means a grid-connected solar power plant where solar panels are installed on a floating structure.

3. "ground-mounted solar power plant" means a grid-connected solar power plant other those described under Clause 2 of this Article.

4. "standard wind power plant" means a power plant in which investors are selected on the basis of implementation of the National Electricity Development Planning, with a popular installed capacity, has not entered into any PPA, is representative of onshore, inshore and offshore wind power plants, and is used for calculation of electricity generation pricing framework for such type of power plant.

5. "onshore wind power plant" means a grid-connected wind power plant where the center of the foundation of the wind turbines are built and operated inside the area whose outer limit is the lowest average sea level of multiple years according to applicable regulations.

6. "offshore wind power plant" means a grid-connected wind power plant where the center of the foundation of the wind turbines are built and operated inside the area from the lowest average sea level of multiple years according to applicable regulations extended 06 nautical miles seaward.

7. “offshore wind power plant” means a grid-connected wind power plant with wind turbines built beyond the 6-nautical-mile waters from the land.

8. “total investment” means the total construction investment of a project determined according to applicable laws and appropriate for the fundamental design and other details under construction investment feasibility reports.

## Chapter II

### METHOD FOR DEVELOPING ELECTRICITY GENERATION PRICING FRAMEWORK

#### Article 3. Rules for developing electricity generation pricing framework

1. The electricity generation pricing framework of ground-mounted solar power plants, floating solar power plants, onshore wind power plants, and offshore wind power plants ranges from the minimum value (0 VND/kWh) to the maximum value, are developed and promulgated in the year.
2. The maximum value applicable to solar power plants shall be electricity generation price of the standard solar power plant determined using methods under Article 4, Article 5, and Article 6 hereof.
3. The maximum value applicable to wind power plants shall be electricity generation price of the standard wind power plant determined using methods under Article 7, Article 8, and Article 9 hereof.
4. The electricity generation pricing framework of ground-mounted and floating solar power plants shall be developed on the basis of the average radiant intensity of the Northern, Central and Southern regions.
5. The standard solar power plant shall be selected for development of electricity generation pricing framework in the regions mentioned in Clause 4 of this Article.

#### Article 4. Method for determining electricity generation price of the standard solar power plant

Electricity generation price  $P_c^{MT}$  (VND/kWh) of the standard solar power plant shall be determined using the following formula:

$$P_c^{MT} = FC^{MT} + FOMC^{MT}$$

Where:

$FC^{MT}$ : Average fixed cost of the standard solar power plant determined in accordance with Article 5 hereof (VND/kWh);

$FOMC^{MT}$ : Fixed operation and maintenance cost of the standard solar power plant determined in accordance with Article 6 hereof (VND/kWh).

#### Article 5. Method for determining average fixed costs of the standard solar power plant

1. The average fixed cost  $FC^{MT}$  (VND/kWh) of the standard solar power plant serves as a component for the purpose of investment recovery and is determined using the formula below:

$$FC^{MT} = \frac{TC^{MT}}{E_{bg}^{MT}}$$

Where:

$TC^{MT}$ : Annual converted investment capital for construction of the standard solar power plant (excluding VAT) determined in accordance with Clause 2 of this Article (VND);

$E_{bg}^{MT}$ : Average electrical energy delivered by the standard solar power plant over multiple years determined in accordance with Clause 5 of this Article (kWh).

2. Annual converted investment capital of standard solar power plant  $TC^{MT}$  (VND) is determined using the following formula:

$$TC^{MT} = (SDT^{MT} \times P^{MT}) \times \frac{(1+i)^{n_{MT}} \times i}{(1+i)^{n_{MT}} - 1}$$

Where:

$SDT^{MT}$ : Investment rate of the standard solar power plant determined in accordance with Clause 3 of this Article (VND/kWp). kWp measures peak capacity of a solar panel in standard condition;

$P^{MT}$ : Installed capacity of the standard solar power plant determined in accordance with Clause 1 Article 2 hereof (kWp);

$n_{MT}$ : Economic life of the standard wind power plant specified under Appendix attached hereto (year);

i: Discount rate of the standard solar power plant determined in accordance with Clause 4 of this Article (%).

3. Investment rate means investment required for 01 kWp of installed capacity of the standard solar power plant (excluding investment in transmission lines and substations to the point of connection, energy storage system) and is determined on the basis of the total investment and exchange rate at the time of calculation of electricity generation prices, with reference to data provided by counseling organizations (if necessary)

4. The discount rate  $i$  (%) applying the nominal pre-tax weighted mean cost of capital of the standard solar power plant is determined using the formula below:

$$i = \frac{(D \times r_d + E \times r_e) \times n_D + r_e \times (n_{MT} - n_D)}{n_{MT}}$$

Where:

D: Ratio of borrowed capital (loan) to total investment prescribed in the Appendix hereof (%);

E: Ratio of equity to total investment prescribed in the Appendix hereof (%);

$n_{MT}$ : Economic life of the standard wind power plant specified in the Appendix hereof (year);

$n_D$ : Average debt repayment period prescribed in the Appendix hereof (year);

$r_d$ : Loan interest rate determined in accordance with Point a of this Clause (%);

$r_e$ : Ratio of pre-tax profit to equity is determined in accordance with Point b of this Clause (%).

a) Loan interest rate  $r_d$  (%) is calculated using weighted mean interest rate of loans in VND and foreign currencies using the formula below:

$$r_d = D_F \times r_{d,F} + D_D \times r_{d,D}$$

Where:

$D_F$ : Ratio of loans in foreign currencies to total loans prescribed in the Appendix hereof (%);

$D_D$ : Ratio of loans in VND to total loans prescribed in the Appendix hereof (%);

$r_{d,F}$ : Foreign currency loan interest shall be equal to the Secured Overnight Financing Rate (SOFR) with an average term of 180 days over 36 months preceding the calculation date announced by FED ([www.newyorkfed.org](http://www.newyorkfed.org)) plus (+) annual average arrangement fee charged by the bank at 3% per year;

$r_{d,D}$ : VND loan interest shall be equal to the average VND deposit interest rate with a term of 12 months for individual customers of 05 years preceding the year of calculation, determined on September 30<sup>th</sup> every year by Vietcombank, VietinBank, BIDV and Agribank or their lawful inheritors, plus (+) the annual average arrangement fee charged by the banks at 3,5% per year.

b) Ratio of pre-tax profit to equity  $r_e$  (%) is determined using the formula below:

$$r_e = \frac{r_{e,pt}}{(1-t)}$$

Where:

$r_{e,pt}$ : Ratio of post-tax profit to equity, which is 12%;

t: Average rate of corporate income tax during economic life of the solar power plant, which is determined in accordance with applicable laws of the State (%).

5. Average annual electrical energy delivered  $E_{bq}^{MT}$  (kWh) by the standard solar power plant is determined using the formula below:

$$E_{bq}^{MT} = A \times r \times H \times PR$$

Where:

A: Total solar panel installation area ( $m^2$ ) commensurate with the installed capacity of the standard solar power plant, which determined in accordance with Clause 6 of this Article;

H: Average annual radiant intensity in three regions (Northern, Central and Southern regions) of the standard solar power plant ( $kWh/m^2/year$ );

r: Solar panel efficiency (%);

PR: Standard solar power plant efficiency (%).

6. A, r, H, PR parameters under Clause 5 of this Article shall be determined on the basis of:

- a) The feasibility study report or approved engineering design of the standard solar power plant; or
- b) Data provided by counseling organizations.

#### **Article 6. Method for determining fixed operation and maintenance costs of the standard solar power plants**

1. Fixed operation and maintenance cost  $FOMC^{MT}$  (VND/kWh) of the standard solar power plant serves as a component to recover major repair costs, personnel costs, and other costs annually and is determined using the formula below:

$$FOMC^{MT} = \frac{TC_{FOMC}^{MT}}{E_{bq}^{MT}}$$

Where:

$TC_{FOMC}^{MT}$ : Total fixed operation and maintenance cost of the standard solar power plant determined in accordance with Clause 2 of this Article (VND);

$E_{bq}^{MT}$ : Average electrical energy delivered by the standard solar power plant over multiple years determined in accordance with Clause 5 Article 5 hereof (kWh).

2. Total fixed operation and maintenance cost  $TC_{FOMC}^{MT}$  (VND) of the standard solar power plant are determined using the formula below:

$$TC_{FOMC}^{MT} = SDT^{MT} \times PMT \times K_{MT}$$

Where:

$SDT^{MT}$ : Investment rate of the standard solar power plant determined in accordance with Clause 3 Article 5 hereof (VND/kWp);

$PMT$ : Installed capacity of the standard solar power plant determined in accordance with Clause 1 Article 2 hereof (kWp);

$K_{MT}$ : Ratio of fixed operation and maintenance cost to investment rate of the standard solar power plant determined according to data provided by counseling organizations.

#### **Article 7. Method for determining electricity generation price of the standard wind power plant**

Electricity generation price  $P_c^G$  (VND/kWh) of the standard wind power plant is determined using the formula below:

$$P_c^G = FC^G + FOMC^G$$

Where:

$FC^G$ : Average fixed cost of the standard wind power plant determined in accordance with Article 8 hereof (VND/kWh);

$FOMC^G$ : Fixed operation and maintenance cost of the standard wind power plant are determined in accordance with Article 9 hereof (VND/kWh).

#### **Article 8. Method for determining average fixed costs of the standard wind power plant**

1. The average fixed costs  $FC^G$  (VND/kWh) of the standard wind power plant serves as a component for the purpose of investment recovery and is determined using the formula below:

$$FC^G = \frac{TC^G}{E_{bq}^G}$$

Where:

$TC^G$ : Annual converted investment in construction of the standard wind power plant (excluding VAT) determined in accordance with Clause 2 of this Article (VND);

$E_{bq}^G$ : Average electrical energy delivered by the standard wind power plant over multiple years determined in accordance with Clause 5 of this Article (kWh).

2. Investment capital of the standard wind power plant converted on an annual basis  $TC^G$  (VND) is determined using the following formula:

$$TC^G = (SDT^G \times P^G) \times \frac{(1+i)^{n_g} \times i}{(1+i)^{n_g} - 1}$$

Where:

SDT<sup>G</sup>: Investment rate of the standard wind power plant determined in accordance with Clause 3 of this Article (VND/kW);

P<sup>G</sup>: Installed capacity of the standard wind power plant determined in accordance with Clause 4 Article 2 hereof (kW);

n<sub>G</sub>: Economic life of the standard wind power plant specified in the Appendix hereof (year);

i: Discount rate of the standard power plant determined in accordance with Clause 4 of this Article (%).

3. Investment rate means investment required for 01 kW of installed capacity of the standard wind power plant (excluding investment in transmission lines and substations to the point of connection, energy storage system) and is determined on the basis of the total investment and exchange rate at the time of calculation of electricity generation prices, with reference to data provided by counseling organization (if necessary)

4. Discount rate i (%) applying the nominal pre-tax weighted mean cost of capital of the standard wind power plant is determined using the formula below:

$$i = \frac{(D \times r_d + E \times r_e) \times n_D + r_e \times (n_G - n_D)}{n_G}$$

Where:

D: Ratio of borrowed capital to total investment prescribed in the Appendix hereof (%);

E: Ratio of equity to total investment prescribed in the Appendix hereof (%);

n<sub>G</sub>: Economic life of the standard wind power plant specified in the Appendix hereof (year);

n<sub>D</sub>: Average debt repayment period prescribed in the Appendix hereof (year);

r<sub>d</sub>: Loan interest rate determined in accordance with Point a of this Clause (%);

r<sub>e</sub>: Ratio of pre-tax profit to equity is determined in accordance with Point b of this Clause (%).

a) Loan interest rate r<sub>d</sub> (%) is calculated using weighted mean interest rate of loans in VND and foreign currencies using the formula below:

$$r_d = D_F \times r_{d,F} + D_D \times r_{d,D}$$

Where:

D<sub>F</sub>: Ratio of loans in foreign currencies to total loans prescribed in the Appendix hereof (%);

D<sub>D</sub>: Ratio of loans in VND to total loans prescribed in the Appendix hereof (%);

r<sub>d,F</sub>: Foreign currency loan interest shall be equal to the Secured Overnight Financing Rate (SOFR) with an average term of 180 days over 36 months preceding the calculation year announced by FED ([www.newyorkfed.org](http://www.newyorkfed.org)) plus (+) annual average arrangement fee charged by the bank at 3% per year;

r<sub>d,D</sub>: VND loan interest shall be equal to the average VND deposit interest rate with a term of 12 months for individual customers of 5 years preceding the year of calculation, determined on September 30<sup>th</sup> every year by Vietcombank, VietinBank, BIDV and Agribank or their lawful inheritors, plus (+) the annual average arrangement fee charged by the banks at 3,5% per year.

b) Ratio of pre-tax profit to equity r<sub>e</sub> (%) is determined using the formula below:

$$r_e = \frac{r_{e,pt}}{(1-t)}$$

Where:

r<sub>e,pt</sub>: Ratio of post-tax profit to equity, which is 12%;

t: Average rate of corporate income tax during economic life of wind power plants is determined in accordance with applicable laws of the State (%).

5. Average annual electrical energy delivered  $E_{bq}^G$  (kWh) by the standard wind power plant is determined using the formula below:

$$E_{bq}^G = E^{G,P50} - E^{G,P50} \times k_{bd} \times k_{pb,P75}$$

Where:

$E^{G,P50}$ : Forecasted average annual electrical energy of 50% delivered by the standard wind power plant determined in accordance with Clause 6 of this Article (kWh);

$k_{bd}$ : Total variability of the standard wind power plant (%);

$k_{pb,P75}$ : Standard distribution factor corresponding to average forecasted electrical energy delivered of 75% by the standard wind power plant specified in the Appendix hereof.

6. The average forecasted electrical energy delivered of 50% by the standard wind power plant (kWh) is determined as follows:

$$E^{G,P50} = 8760 \times P^G \times k_{CF}$$

Where:

$P^G$ : Installed capacity of the standard wind power plant determined in accordance with Clause 4 Article 2 hereof (kW);

$k_{CF}$ : Capacity factor of the standard wind power plant (%);

7.  $k_{CF}$ ,  $k_{bd}$  under Clause 5 and Clause 6 of this Article are determined on the basis of:

- a) The feasibility study report or approved engineering design of the standard wind power plant; or
- b) Data provided by counseling organizations.

### **Article 9. Method for determining fixed operation and maintenance costs of standard wind power plants**

1. Fixed operation and maintenance costs  $FOMC^G$  (VND/kWh) of the standard wind power plant serves as a component to recover major repair costs, personnel costs, and other costs annually and is determined using the formula below:

$$FOMC^G = \frac{TC_{FOMC}^G}{E_{bg}^G}$$

Where:

$TC_{FOMC}^G$ : Total fixed operation and maintenance cost of the standard wind power plant determined in accordance with Clause 2 of this Article (VND);

$E_{bg}^G$ : Average annual electrical energy delivered by the standard wind power plant determined in accordance with Clause 5 Article 8 hereof (kWh).

2. Total fixed operation and maintenance cost  $TC_{FOMC}^G$  (VND) of the standard wind power plant is determined using the formula below:

$$TC_{FOMC}^G = S\Delta T^G \times P^G \times k_G$$

Where:

$S\Delta T^G$ : Investment rate of the standard wind power plant determined in accordance with Clause 3 Article 8 hereof (VND/kW);

$P^G$ : Installed capacity of the standard wind power plant (kW) prescribed in Clause 4 Article 2 hereof (kW);

$k_G$ : Ratio of fixed operation and maintenance cost to investment rate of the standard wind power plant determined according to data provided by counseling organizations (%).

## **Chapter III**

### **PROCEDURES FOR DEVELOPING AND PROMULGATING ELECTRICITY PRICING FRAMEWORKS**

#### **Article 10. Procedures for developing and promulgating electricity pricing frameworks**

1. Before November 1<sup>st</sup> every year, EVN shall:

- a) Propose selection of a standard solar power plant and standard wind power plant for development of the electricity pricing framework.
- b) Carry out calculation or hire a counseling organization to select a set of parameters and calculate electricity prices of the standard solar power plant and standard wind power plant in accordance with Chapter II of this Circular.
- c) Prepare documentation for calculation of the next year's electricity generation pricing frameworks of ground-mounted solar power plants, floating solar power plants, onshore, inshore and offshore wind power plants in accordance with Article 11 hereof, and submit them to the Electricity Regulatory Authority of Vietnam for appraisal.

2. Within 5 working days from the date of receipt of the application for approval of electricity generation pricing framework mentioned in Article 11 of this Circular, Electricity Regulatory Authority shall examine its adequacy and validity. If necessary, Electricity Regulatory Authority will send a document requesting EVN to revise, supplement or explain the contents of the application. Within 15 working days from the date of receipt of the request from Electricity Regulatory Authority, EVN shall send an explanatory report as requested.

3. If EVN's application is valid and the explanatory report is satisfactory, within 20 working days from the date of receipt of the application, Electricity Regulatory Authority shall organize appraisal of the electricity generation pricing frameworks proposed by EVN.

If necessary, Electricity Regulatory Authority of Vietnam may consult the Advisory Board established by the Ministry of Industry and Trade or the affected entities. The Advisory Board has up to 9 members, including a Chairperson, a Vice Chairperson, a Secretary, and representatives of relevant entities of Ministry of Industry and Trade with appropriate qualifications and comprehensive understanding in electricity generation.

4. Within 15 working days from the date of appraisal, Electricity Regulatory Authority of Vietnam shall request the Minister of Industry and Trade to consider approving the next year's electricity pricing frameworks of ground-mounted solar power plants, floating solar power plants, onshore, inshore and offshore wind power plants, and publish them on the website of Electricity Regulatory Authority. Before the next year's electricity pricing framework, the latest electricity pricing framework may be temporarily applied.

#### **Article 11. Application for approval of electricity generation pricing frameworks**

An application for approval of electricity generation pricing frameworks of ground-mounted solar power plants, floating solar power plants, onshore, inshore and offshore wind power plants consists of:

1. EVN's written description of the selection of parameters and calculation of electricity generation pricing frameworks.
2. The datasheet and documents on calculating electricity generation prices of the standard solar power plant and standard wind power plant in accordance with Chapter II and the Appendix hereof.
3. Documents pertaining to the parameters for calculation of electricity generation prices.

#### **Chapter IV**

### **IMPLEMENTATION CLAUSES**

#### **Article 12. Implementation organization**

1. Electricity Regulatory Authority shall appraise annual electricity generation pricing frameworks and submit them to the Minister of Industry and Trade for approval.
2. If necessary, Electricity Regulatory Authority shall re-develop the datasheets used for calculation of electricity generation prices of the standard solar power plant and standard wind power plant according to the Appendix hereof, and submit a report to the Ministry of Industry and Trade for consideration and decision.
3. EVN shall:
  - a) Select or hire a counseling organization to select a standard solar power plant and standard wind power plant.
  - b) Calculate or hire a counseling organization to calculate electricity generation prices for ground-mounted solar power plants, floating solar power plants, onshore, inshore and offshore wind power plants.
  - c) Submit to Electricity Regulatory Authority the documentation for calculation of the next year's electricity generation pricing frameworks of ground-mounted solar power plants, floating solar power plants, onshore, inshore and offshore wind power plants in accordance with Article 10 and Article 11 of this Circular.

#### **Article 13. Entry into force**

1. This Circular comes into force from December 19<sup>th</sup> 2023.
2. In case If the legislative documents referred to in this Circular are amended or replaced by other legislative documents, the new documents shall prevail.
3. Difficulties that arise during the implementation of this Circular should be reported to the Ministry of Industry and Trade for amendment./.

**PP MINISTER  
DEPUTY MINISTER**

**APPENDIX**

PARAMETERS FOR CALCULATION OF ELECTRICITY GENERATION PRICING FRAMEWORKS  
(Promulgated together with Circular No. 19/2023/TT-BCT dated November 1<sup>st</sup> 2023 of the Minister of Industry and Trade)

**I. PARAMETERS FOR CALCULATION OF ELECTRICITY GENERATION PRICES OF STANDARD SOLAR POWER PLANTS AND STANDARD WIND POWER PLANTS**

No.	Item	Symbol	Parameter
<b>I</b>	<b>Economic life</b>		
1	Standard solar power plant	$n_{MT}$	20 years
2	Standard wind power plant	$n_G$	20 years
<b>II</b>	<b>Operational parameters</b>		
1	Standard distribution factor according to the forecasted average electrical energy delivered by the standard wind power plant of 75%	$k_{pb,P75}$	0,674
<b>III</b>	<b>Ratio of capital sources in the total capital of a standard solar power plant or wind power plant (%)</b>		
1	Ratio of loans	D	70%
2	Ratio of equity	E	30%
3	Ratio of loans in foreign currency	$D_F$	80%
4	Ratio of loans in VND	$D_D$	20%
<b>IV</b>	<b>Average debt repayment period (year)</b>	$n_D$	10 years

**II. MAIN PARAMETERS OF STANDARD SOLAR POWER PLANTS AND STANDARD WIND POWER PLANTS**

No.	Content	Symbol	Unit
<b>I</b>	<b>Annually converted investment capital</b>	$TC_{FOMC}^{MT,G}$	VND
1	Investment rate	$SDT_{MT,G}$	VND/kWp or VND/kW
2	Installed capacity	$P_{MT}, P_G$	kWp, kW
<b>II</b>	<b>Economic life</b>	$n_{MT}, n_G$	Year
<b>III</b>	<b>Average electrical energy at delivery point</b>	$E_{bq}$	kWh
1	Operational parameters (for calculation of average annual electrical energy delivered)		
<b>IV</b>	<b>Discount rates</b>	i	%
1	Ratio of loans in foreign currency	$D_F$	%
2	Ratio of loans in VND	$D_D$	%
3	Interest rate of loans in foreign currencies	$r_{d,F}$	%
4	Interest rate of loans in VND	$r_{d,D}$	%
3	Pre-tax profit ratio	$r_e$	%
3.1	Ratio of post-tax profit to equity	$r_{e,pt}$	%
3.2	Average rate of corporate income tax during economic life	t	%
<b>A</b>	<b>Average fixed price</b>	FC	VND/kWh
	Total fixed operation and maintenance cost	$TC_{FOMC}$	VND



<b>B</b>	<b>Fixed operation and maintenance cost</b>	FOMC	VND/kWh
<b>C</b>	<b>Electricity generation price (A+B)</b>	$P_C^{MT}; P_C^G$	VND/kWh