

## CIRCULAR

### ENERGY CONSUMPTION BENCHMARKING OF CANE SUGAR PRODUCTION

*Pursuant to Decree No. 98/2017/ND-CP dated August 18, 2017 of the Government on functions, tasks, powers, and organizational structure of the Ministry of Industry and Trade;*

*Pursuant to Law on Efficient and Effective Use of Energy dated June 28, 2010;*

*Pursuant to Decree No. 21/2011/ND-CP dated March 29, 2011 of Government on elaborating to Law on Efficient and Effective Use of Energy;*

*At request of Director General of Energy Efficiency and Sustainable Development Department;*

*Minister of Industry and Trade promulgates Circular on energy consumption benchmarking of cane sugar production.*

#### Chapter I

#### GENERAL PROVISIONS

##### Article 1. Scope

This Circular prescribes:

1. Energy consumption benchmark of cane sugar production during the period that lasts until the end of 2025 and the period from 2026 to the end of 2030.
2. Methods of determining the specific energy consumption in cane sugar production facilities.
3. Artificial sweeteners, dextrose, bioethanol, and other sugar products that are not within the scope of this Circular.

##### Article 2. Regulated entities

1. Cane sugar production facilities with scale of 1.000 tonne of cane/day upwards across the country.
2. Other relevant agencies and organizations.

##### Article 3. Definitions and Interpretation of Terms

1. "Specific energy consumption" (SEC) refers to total energy necessary to produce one tonne of products, expressed in Mega joule (MJ).
2. "Energy consumption benchmark" refers to the target SEC to be achieved in each stage of production in accordance with this Circular.
3. "White sugar" (known as 'refined standard', or 'RS' sugar in Vietnam) refers to sucrose which has been refined and crystallized with a minimum of 99,7% of pol according to TCVN 7968:2008 on *Sugars*.
4. "Refined sugar" (known as 'refined extra', or 'RE' sugar in Vietnam) refers to sucrose which has been refined and crystallized directly from sugarcane, raw sugar, or other ingredients mentioned under the TCVN 6958:2001 *Refined sugars*.
5. "Brown sugar" refers to sucrose with a distinctive brown color due to the presence of molasses. Brown sugar is a non-refined or partially refined granulated sugar according to the National Standard TCVN 7968:2008 (CODEX STAN 212: 1999) regarding description of sugar products ready for use without further processing.
6. "Raw sugar" refers to sucrose which has been crystallized from sugarcane juice, and partially, but not entirely, processed for centrifugal or drying, and characterized by sucrose crystals coated with molasses according to TCVN 7968:2008 *Sugars*.
7. "Equivalent product" refers to a result of converting different sugar products manufactured from sugarcane to a product equivalent to white sugar in order to calculate SEC of a product unit.

## Chapter II

### ENERGY CONSUMPTION BENCHMARKING AND SOLUTIONS TO INCREASING ENERGY EFFICIENCY IN CANE SUGAR PRODUCTION

#### Article 4. Methods of determining SEC

SEC in cane sugar production is determined by using methods under Appendix I hereof.

#### Article 5. Energy consumption benchmark

1. Energy consumption benchmark of cane sugar production for the period that lasts until the end of 2025.

No.	Production facility's scale	Unit	Benchmark
1	1.000 to 3.000 tonne of sugarcane/day	MJ/tonne of product equivalent	30.000
2	3.000 to 6.000 tonne of sugarcane/day	MJ/tonne of product equivalent	23.000
3	Above 6.000 tonne of sugarcane/day	MJ/tonne of product equivalent	19.000

2. Energy consumption benchmark of cane sugar production for the period that lasts from 2026 until the end of 2030.

No.	Production facility's scale	Unit	Benchmark
1	1.000 to 3.000 tonne of sugarcane/day	MJ/tonne of equivalent products	25.000
2	3.000 to 6.000 tonne of sugarcane/day	MJ/tonne of equivalent products	18.000
3	Above 6.000 tonne of sugarcane/day	MJ/tonne of equivalent products	17.000

#### Article 6. Requirements regarding assurance of energy consumption benchmark in stages

1. SEC of a cane sugar production facility in each stage must not exceed the energy consumption benchmark mentioned under Article 5 hereof, to be specific:

- a. Before January 1, 2026, the cane sugar production facility must meet the benchmark under Clause 1 Article 5 hereof;
- b. Before January 1, 2031, the cane sugar production facility must meet the benchmark under Clause 2 Article 5 hereof.

2. In case SEC of a cane sugar production facility is higher than the benchmark intended for the stage, the facility must prepare and adopt solutions for improving energy efficiency so as to fulfill requirements under Article 5 hereof.

3. Before August 15 of every year, cane sugar production facilities are responsible for submitting reports on their compliance with the energy consumption benchmarking for the period from August 1 of the previous year to July 31 of the current year in accordance with Appendix IV hereof to the local Departments of Industry and Trade in writing.

#### Article 7. Solutions to increasing energy efficiency in cane sugar production

1. Solutions relating to management include:

- a. Improvement of management of energy consuming activities in cane sugar production facilities
- b. Development and maintaining of energy management system in cane sugar production facilities.

2. Solutions relating to engineering and technology include:

- a. Optimization of manufacturing procedures
- b. Use of energy-efficient equipment.

3. Cane sugar production facilities are encouraged to adopt solutions for improving energy efficiency in accordance with Clause 1, Clause 2 Article 7 and Appendix II attached hereto.

### **Chapter III**

#### **IMPLEMENTATION**

##### **Article 8. Responsibilities of Energy Efficiency and Sustainable Development Department**

1. Take the lead and cooperate with relevant authorities in guiding, inspecting, and supervising the implementation of this Circular.
2. Cooperate with Departments of Industry and Trade of provinces to inspect the implementation of energy consumption benchmarking and feasibility of plans in order to enforce energy consumption benchmarking as scheduled.
3. Consolidate and submit reports on implementation of the Circular to the Ministry of Industry and Trade and propose actions against failure to adequately implement this Circular.

##### **Article 9. Responsibilities of Departments of Industry and Trade**

1. Cooperate with the Energy Efficiency and Sustainable Development Department and Ministry of Industry and Trade in guiding, promoting, and inspecting the compliance with this Circular.
2. On an annual basis, guide, promote, and inspect reports produced using Appendix IV and compliance with energy consumption benchmarking of cane sugar production facilities of provinces and cities under this Circular.
3. On an annual basis, inspect feasibility of plans in order to ensure adherence to energy consumption benchmarking of cane sugar production facilities in provinces and cities which have not met energy consumption benchmarking.
4. Consolidate annual implementation of energy consumption benchmarking of cane sugar production facilities in provinces and cities and submit written reports to Energy Efficiency and Sustainable Development Department, Ministry of Industry and Trade before September 15 every year in accordance with Appendix III hereof.

##### **Article 10. Transition clauses**

1. No later than 6 months after entry into force of this Circular, cane sugar production facilities which are unable to determine energy consumption benchmark as per this Circular are responsible for installing adequate energy meter in order to calculate SEC of the facilities.
2. Within 12 months from the effective date hereof, cane sugar production facilities which have not met the energy consumption benchmark in accordance with Article 5 hereof are responsible for producing plans for improving energy efficiency in order to meet the energy consumption benchmark and reporting to the local Departments of Industry and Trade.

##### **Article 11. Entry into force**

1. This Circular comes into force from January 14, 2020.
2. Difficulties that arise during the implementation of this Circular should be reported to the MOIT for consideration./.

**MINISTER**

**Tran Tuan Anh**

## APPENDIX I

### METHODS OF DETERMINING SPECIFIC ENERGY CONSUMPTION IN CANE SUGAR PRODUCTION FACILITIES

*Attached to MOIT's Circular No. 39/2019/TT-BCT dated November 29, 2019*

1. Scope of assessment shall cover the cane sugar production facilities, excluding areas for cultivation, planting, transport vehicles, and electricity generated onto national electrical grid.
2. The period of determining SEC of cane sugar production facilities lasts from August 1 of the previous year to July 31 of the reporting year.
3. Parameters used in calculation of SEC in cane sugar production facilities:

<i>Parameter</i>	<i>Explanation</i>	<i>Unit</i>
E <sub>PR</sub>	Total primary fuel	MJ
E <sub>P</sub>	Purchased electricity	kWh
E <sub>S</sub>	Sold electricity	kWh
P <sub>RS</sub>	Amount of white sugar produced during the period in which SEC is being determined	tonne
P <sub>R</sub>	Amount of raw sugar produced during the period in which SEC is being determined	tonne
P <sub>BR</sub>	Amount of brown sugar produced during the period in which SEC is being determined	tonne
P <sub>RE</sub>	Amount of refined sugar produced during the period in which SEC is being determined	tonne

4. SEC of cane sugar production facilities is determined using Formula 1 below:

$$SEC = \frac{E_{PR} + E_{E_P} - E_{E_S}}{P_{td}} \quad [MJ]/\text{t\`an SP} \quad \text{(Formula 1)}$$

*In which:*

- SEC: Specific energy consumption [MJ/tonne of product]
- E<sub>PR</sub>: Total primary fuel [MJ] and determined using Formula 2 below:

$$E_{PR} = \sum F_i * CF_i \quad [MJ] \quad \text{(Formula 2)}$$

*In which:*

- *F<sub>i</sub>*: Type *i* primary fuel
- *CF<sub>i</sub>*: Heat capacity of fuel type *i* (Refer to the Schedule at the end of Appendix I)
- E<sub>E\_P</sub>: Electricity purchased from electrical grid [MJ] is determined using Formula 3 below:

$$E_{E_P} = E_P * CF \quad [MJ] \quad \text{(Formula 3)}$$

*In which:*

- *E<sub>P</sub>*: Electricity purchased from electrical grid [kWh]
- *CF*: Heat capacity (Refer to Schedule at the end of Appendix I)
- E<sub>E\_S</sub>: Primary fuel for producing Electricity sold onto the grid [MJ] is determined using Formula 4 below:

$$E_{E_S} = \frac{E_S * CF}{0,35} \quad [MJ] \quad \text{(Formula 4)}$$

*In which:*

- *E<sub>S</sub>*: Electricity sold onto the grid [kWh]
- *CF*: Heat capacity (Refer to the Schedule at the end of Appendix I)
- P<sub>td</sub>: Total equivalent products [tonne of products]. In order to ensure consistency when making comparisons, all sugar products (raw sugar, brown sugar, white sugar, and refined sugar) are converted to equivalent products using Formula 5 below:

$$P_{td} = P_{RS} + 0.98315 \cdot P_R + P_{BR} + 1.09685 \cdot P_{RE} \text{ [tonne]} \text{ (Formula 5)}$$

In which:

- $P_{td}$ : Equivalent sugar product [tonne]
- $P_{RS}$ : White sugar product [tonne]
- $P_R$ : Raw sugar product [tonne]
- $P_{BR}$ : Brown sugar product [tonne]
- $P_{RE}$ : Refined sugar product [tonne]
- 0.98315: conversion factor from raw sugar to equivalent product
- 1.09685: conversion factor from refined sugar to equivalent product

Due to the many forms of energy, forms of energy will be converted using the factors below:

No.	Form of energy	Unit	Factor MJ/unit
1	Electricity	kWh	3.60
2	Coal dust type 1, 2	Tonne	29,309
3	Coal dust type 3, 4	Tonne	25,122
4	Coal dust type 5, 6	Tonne	20,935
5	Diesel oil	Tonne	42,707.40
		1000 liters	36,845.60
6	Fuel oil	Tonne	41,451.30
		1000 liters	39,357.80
7	Liquefied petroleum gas	Tonne	45,638.30
8	Steam (6 bar)	Tonne	2,755.46
9	Steam (7 bar)	Tonne	2,761.00
10	Steam (9 bar)	Tonne	2,773.03
11	Steam (15 bar)	Tonne	2,801.93
12	Steam (21 bar)	Tonne	2,799.26
13	Steam (23 bar)	Tonne	2,800.82
14	Steam (25 bar)	Tonne	2,801.93
15	Steam (30 bar)	Tonne	2,803.15
16	Steam (35 bar)	Tonne	2,802.64
17	Steam (40 bar)	Tonne	2,800.82
18	Steam (45 bar)	Tonne	2,797.95
19	Steam (50 bar)	Tonne	2,794.21
20	Steam (55 bar)	Tonne	2,789.72
21	Steam (60 bar)	Tonne	2,784.59
22	Steam (70 bar)	Tonne	2,772.63
23	Steam (80 bar)	Tonne	2,758.68
24	Steam (90 bar)	Tonne	2,742.94
25	Steam (100 bar)	Tonne	2,725.49
26	Steam (110 bar)	Tonne	2,706.35
27	Steam (120 bar)	Tonne	2,686.45

28	Sugarcane bagasse	Tonne	7,464.00
29	Sawdust	Tonne	15,223.00
30	Dry rice husk	Tonne	15,906.80

Unofficial Translation- For reference only

## APPENDIX II

### SEVERAL SOLUTIONS FOR INCREASING ENERGY EFFICIENCY IN CANE SUGAR PRODUCTION

*Attached to Circular No. 39/2019/TT-BCT dated November 29, 2019 of Minister of Industry and Trade*

1. Enhance internal management; formulate mechanisms for mandating energy efficiency responsibilities in production facilities.
2. Optimize combustion process in boilers by experimenting and adjusting boilers.
3. Utilize the resulting heat to dry sugarcane bagasse.
4. Ensure effective operation of energy-saving equipment in boilers.
5. Comply with periodic maintenance procedures of boilers and insulation layers around boilers.
6. Operate boilers at close to 90% of their rated capacity.
7. Increase superheated steam parameters and replace steam-based transmission system with electric motors in production lines.
8. Reduce corrosion of turbines to help increase electricity generation efficiency
9. Replace back pressure turbines with condensing turbine with steam extraction points.
10. Optimize steam distribution system
11. Optimize technology process in evaporation of sugarcane juice.
12. Prepare evaporating equipment with design suitable for saving saturated steam.
13. Recirculate condensate water
14. Increase Brix content prior to processing.
15. Reuse steam from multiple effect evaporators.
16. Use continuous horizontal tube digester.
17. Recover waste heat produced from sugar drying process.
18. Automate sugar drying process.
19. Use steam instead of hot water if temperature above 95°C is needed.
20. Improve air compressors.
21. Replace DC motors with AC motors.
22. Use high-efficiency transformers.
23. Replace regular motors with high-efficiency motors.
24. Install power inverters for motors.
25. Replace steam turbines with electrical motors for water pumps and crushers.
26. Install high-efficiency lighting system.
27. Invest in replacing sugarcane milling system with diffusion system in order to minimize the use of electricity and steam for pressing system and increase steam used for electricity generation.
28. Invest in modern inverter-driven regenerative batch centrifuges.
29. Invest in modernized sugar refining systems to replace conventional methods which utilize mixing blades.

**APPENDIX III**

SAMPLE REPORT ON IMPLEMENTATION OF ENERGY CONSUMPTION BENCHMARKING IN  
CANE SUGAR PRODUCTION  
Attached to Circular No. 39/2019/TT-BCT dated November 29, 2019 of Minister of Industry and Trade

**(For use by Departments of Industry and Trade)**

PEOPLE'S COMMITTEE OF  
.....  
**DEPARTMENT OF INDUSTRY  
AND TRADE**  
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**SOCIALIST REPUBLIC OF VIETNAM**  
**Independence – Freedom – Happiness**  
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No. ....

(Location and date)

**REPORT**

**ON THE IMPLEMENTATION OF ENERGY CONSUMPTION BENCHMARKING IN CANE SUGAR  
PRODUCTION IN ..... (year)**

**To: Energy Efficiency and Sustainable Development Department, Ministry of Industry and Trade**

Pursuant to Circular No. ..../2019/TT-BCT dated ....., 2019 of Ministry of Industry and Trade on energy consumption benchmarking in cane sugar production, the Department of Industry and Trade of ..... hereby submits report on implementation of energy consumption benchmarking in cane sugar production under management as follows:

- Number of cane sugar production facilities: .....
- Number of production facilities have submitted reports: .....
- Number of production facilities have not submitted reports: .....

*In which:*

- Number of facilities satisfied: .....
- Number of facilities requiring enhanced supervision: .....

Details of cane sugar production facilities under management are listed below

*Schedule 1. List of cane sugar production facilities under management*

No.	Name of facility	TIN	Product (Tonne)				Report submission status	
			Raw sugar	Brown sugar	White sugar	Refined sugar	Submitted	Not submitted
1								
2								
...								
<b>Total</b>								

*Schedule 2. SEC of cane sugar production facilities that have submitted their reports*

No.	Name of facility	Total throughput (Tonne of products)	SEC (MJ/tonne)		Assessment		
			Previous reporting period	Current reporting period	Qualified	Unqualified	
1							
2							
...							
<b>Total</b>							



Schedule 3. List of production facilities that require enhanced supervision

No.	Name of facility	Details placed under enhanced supervision			Specific notes, if any
		Not submitted reports	Failed to meet the energy benchmark	Other	
1					
2					
...					
<b>Total</b>					

Suggestions and recommendations regarding implementation of the Circular (if any)

.....  
 .....

**REPRESENTATIVE OF DEPARTMENT OF  
 INDUSTRY AND TRADE**  
 (signature, full name, and seal)

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**APPENDIX IV**

**SAMPLE ANNUAL REPORT ON IMPLEMENTATION OF ENERGY CONSUMPTION  
BENCHMARKING**

*Attached to Circular No. 39/2019/TT-BCT dated November 29, 2019 of Minister of Industry and Trade*

**(For use by cane sugar production facilities)**

**Name of production facility**

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**SOCIALIST REPUBLIC OF VIETNAM  
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No. ....

*(Location and date)*

**REPORT ON IMPLEMENTATION OF ENERGY CONSUMPTION BENCHMARKING**

**To: Department of Industry and Trade of ..... Province/City**

Pursuant to Circular No. ..../2019/TT-BCT dated ....., 2019 of Minister of Industry and Trade on energy consumption benchmarking in cane sugar production, ..... (Name of production facility) hereby submits report on the implementation of energy consumption benchmarking at production facility as follows:

- Name of production facility: .....
- Address: .....
- Tax identification number: .....

*The information below is compiled for the period from August 1, 20... to July 31, 20...*

**I. General information**

<b>Ingredients</b>  <i>Tonne of sugarcane year</i>	<b>Productivity and product</b>				
	Raw sugar	Brown sugar	White sugar	Refined sugar	Other
	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>

**II. Basic operational parameters**

**1. Boiler parameters:**

<b>Parameter</b>	<b>Unit</b>	<b>Boiler No. 1</b>	<b>Boiler No. 2</b>	<b>Boiler No. 3</b>	<b>Boiler No. 4</b>
Design capacity	Tonne/hour				
Actual capacity	Tonne/hour				
Working pressure	Bar				
Exit temperature	oC				
Annual steam flow rate	Tonne of steam/year				

**2. Steam parameters:**

<b>Inlet</b>		<b>Outlet</b>		<b>To technical processes</b>	
Pressure	Temperature	Pressure	Temperature	Pressure	Temperature
<i>Bar</i>	<i>oC</i>	<i>Bar</i>	<i>oC</i>	<i>Bar</i>	<i>oC</i>

### III. Energy consumption parameters

#### 1. Fuel:

Bagasse	Other biomass	Fuel oil	Diesel oil	Coal	LPG/CNG	Other
<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>	<i>Tonne / Year</i>

#### 2. Electricity:

Generator	Sell onto electrical grid	Purchase from electrical grid
<i>kWh / year</i>	<i>kWh / year</i>	<i>kWh / year</i>

### IV. Consumption rate

Parameter	Unit	Value
SEC of current year	MJ/tonne of product	
Energy saved for following year	MJ	
	%	
Estimated SEC of following year	MJ/tonne of product	
<i>Compared to the energy benchmark of the same period last year</i>	%	

### V. Plans for saving energy

No	Name of solution	Energy-saving potential				Progress												
		Energy	Unit	Value	% potential	1	2	3	4	5	6	7	8	9	10	11	12	
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

### VI. Suggestions and recommendations regarding implementation of the Circular (if any)

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*(Location and date)*  
**LEGAL REPRESENTATIVE**  
*(Signature and full name)*

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