nationalgrid
THE POWER OF ACTION

Offshore BMU Configuration



Steve Curtis

Offshore: System Operator role

- Need to:
  - Manage Transmission Flows (>=132kV)

    Achieve by Dispatching BMUs

    Therefore BMUs must discretely manage transmission flows

    i.e. Must understand relationship of BMUs to flow routes

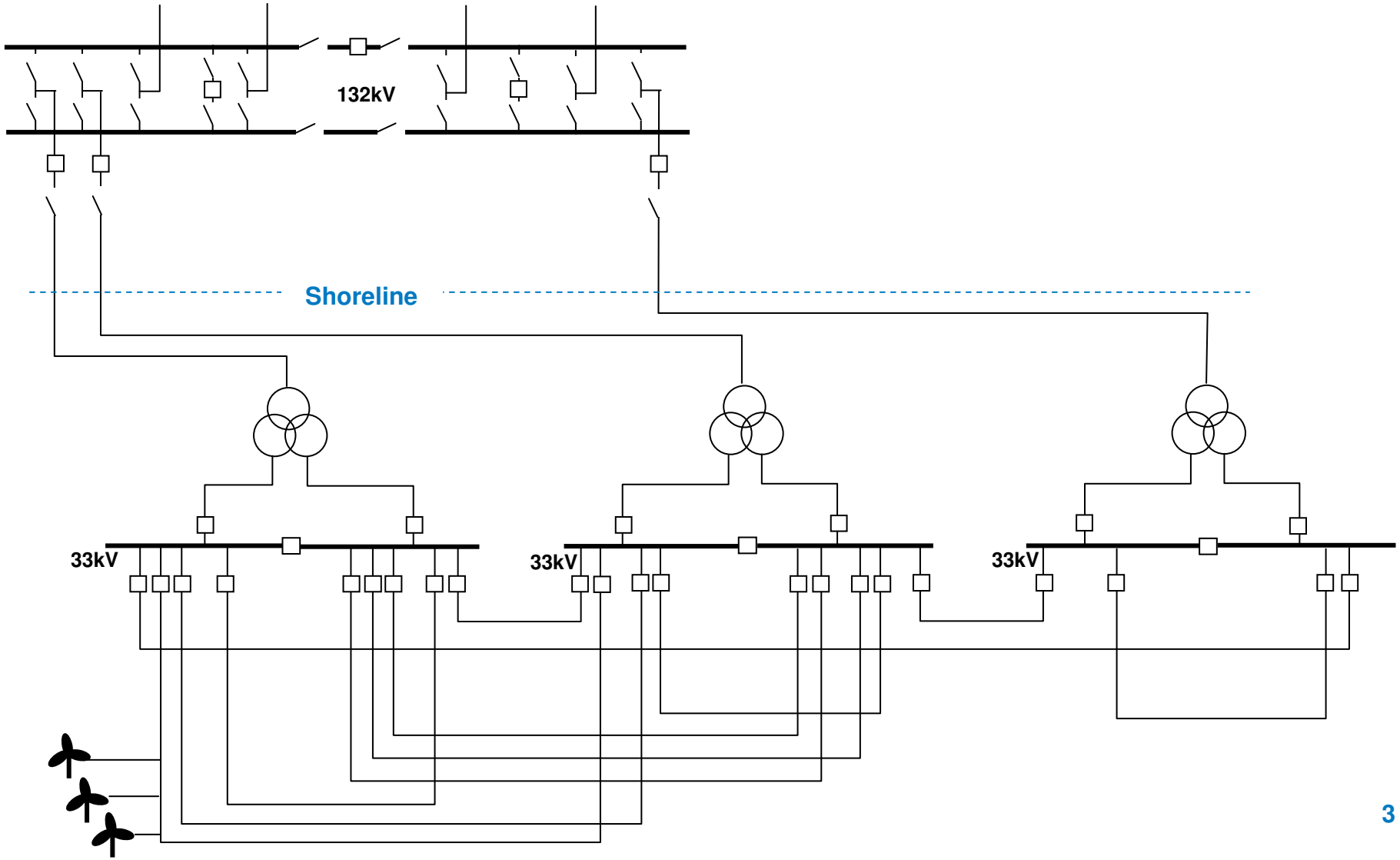
    BMUs Must not parallel MITS

  - Manage Fault Levels

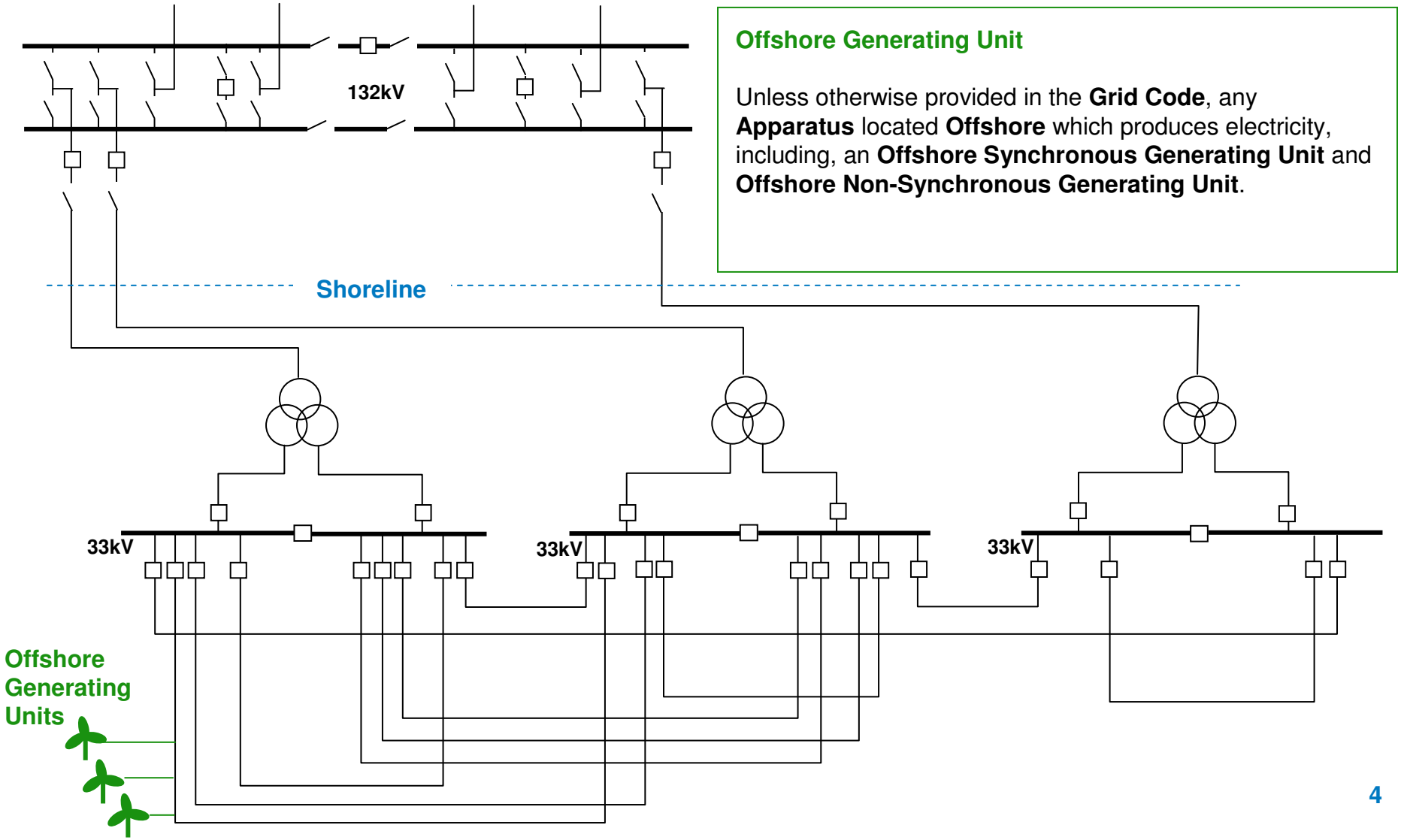
    Need to know constitution of PPM and discrete fault infeeds

  - Coordinate switching
    - Which switches?

Offshore Network Definitions



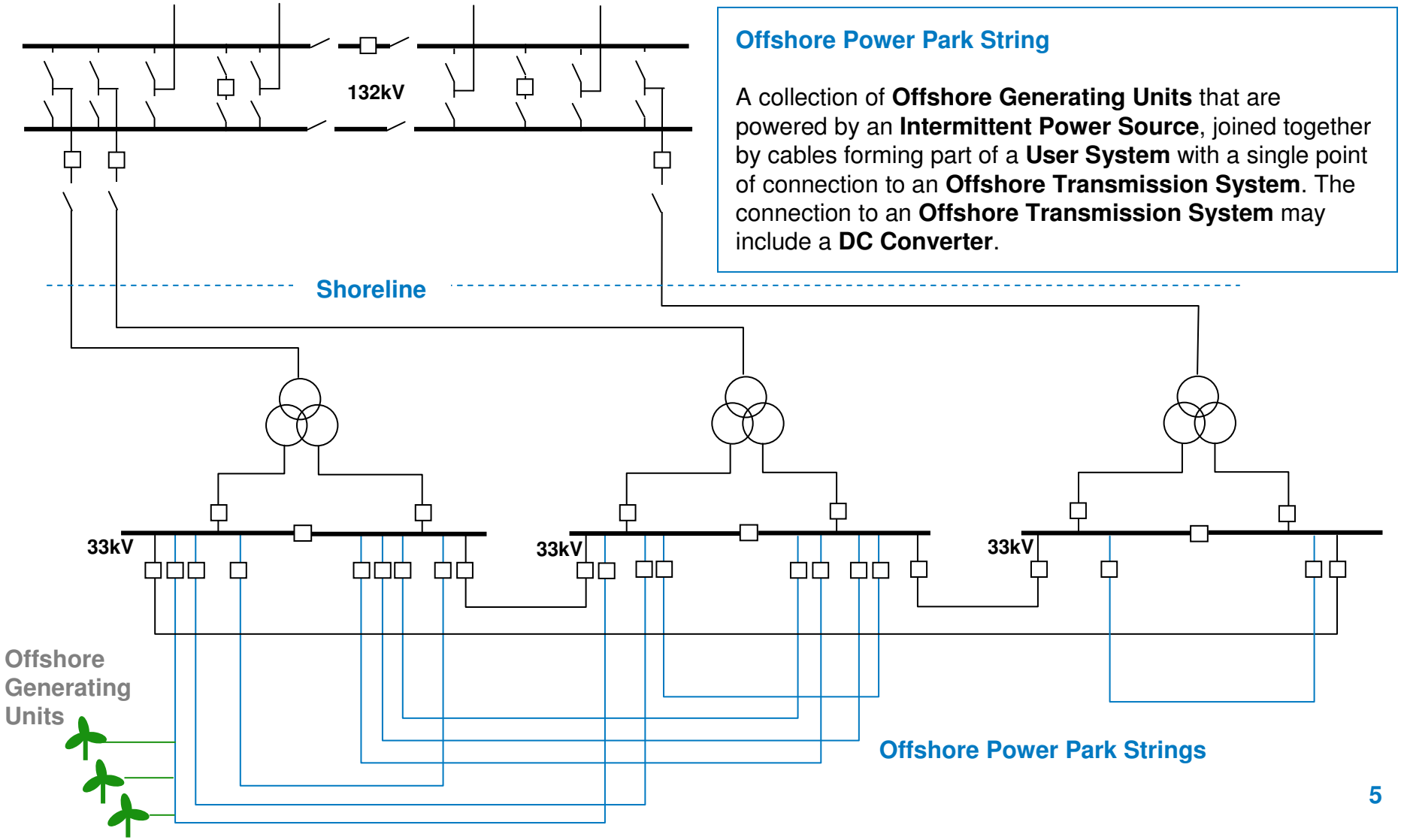
Offshore Network Definitions



Offshore Generating Unit

Unless otherwise provided in the **Grid Code**, any **Apparatus** located **Offshore** which produces electricity, including, an **Offshore Synchronous Generating Unit** and **Offshore Non-Synchronous Generating Unit**.

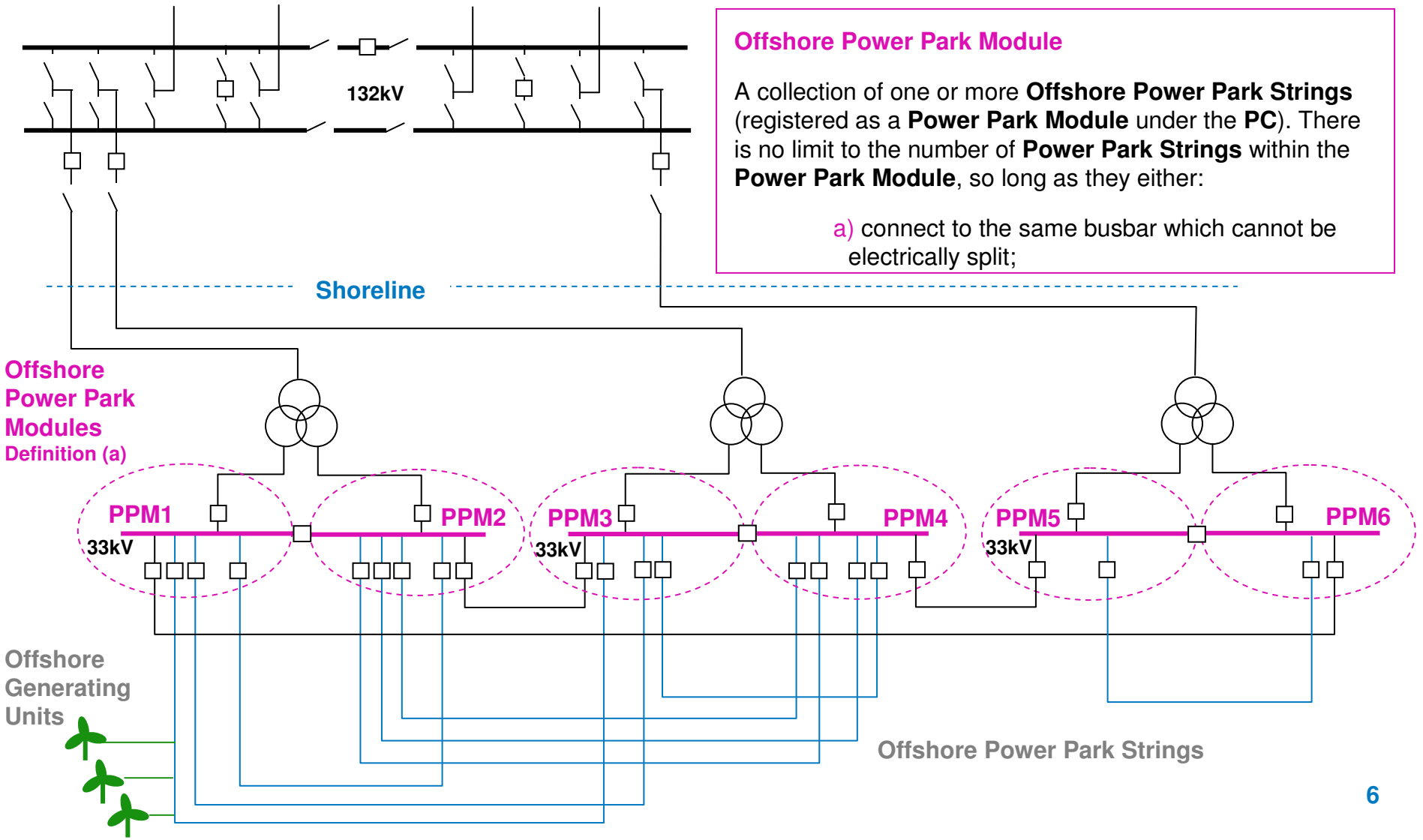
Offshore Network Definitions



Offshore Power Park String

A collection of **Offshore Generating Units** that are powered by an **Intermittent Power Source**, joined together by cables forming part of a **User System** with a single point of connection to an **Offshore Transmission System**. The connection to an **Offshore Transmission System** may include a **DC Converter**.

Offshore Network Definitions

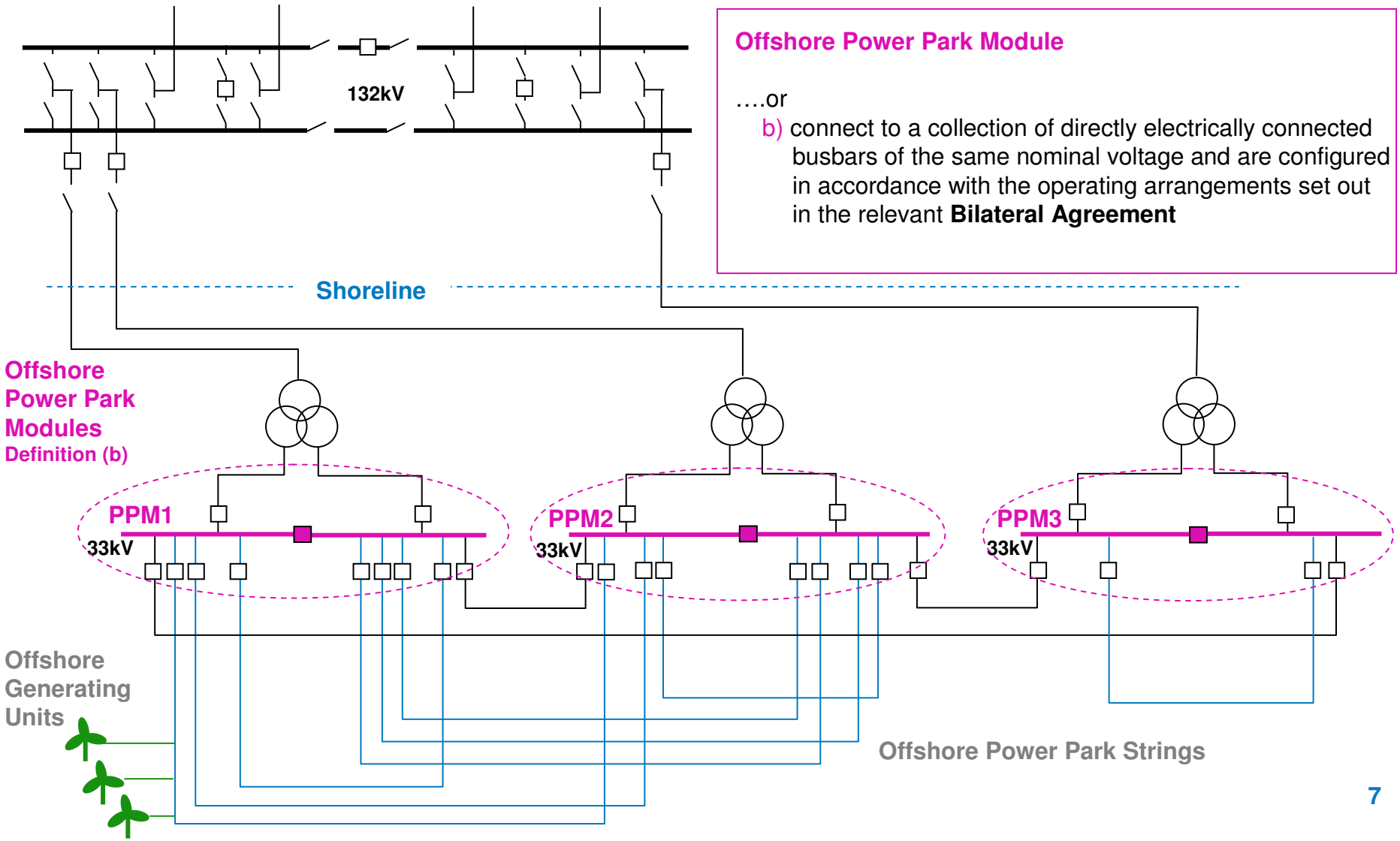


Offshore Power Park Module

A collection of one or more **Offshore Power Park Strings** (registered as a **Power Park Module** under the **PC**). There is no limit to the number of **Power Park Strings** within the **Power Park Module**, so long as they either:

a) connect to the same busbar which cannot be electrically split;

Offshore Network Definitions

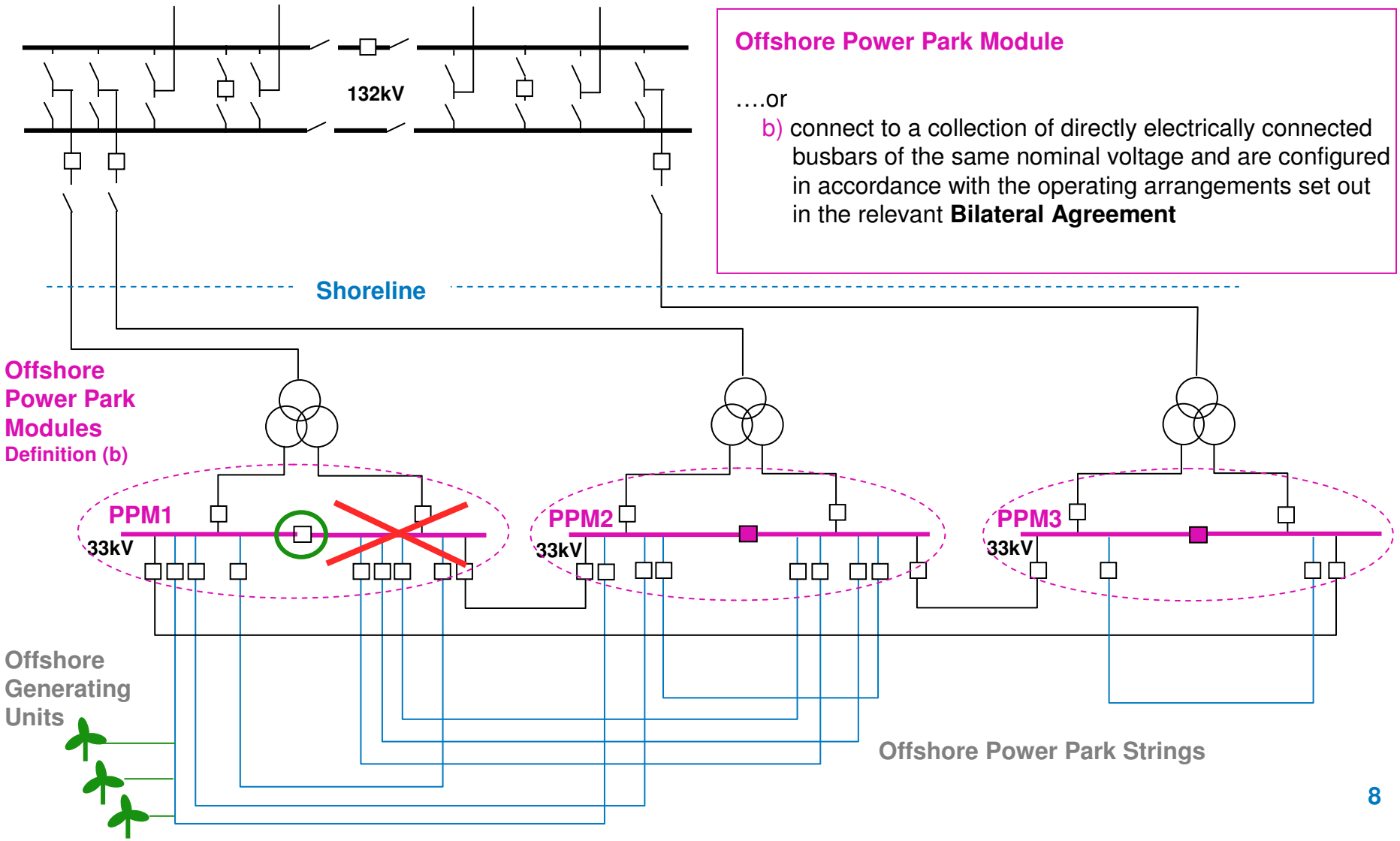


Offshore Power Park Module

….or

b) connect to a collection of directly electrically connected busbars of the same nominal voltage and are configured in accordance with the operating arrangements set out in the relevant **Bilateral Agreement**

Offshore Network Definitions



Offshore Power Park Module

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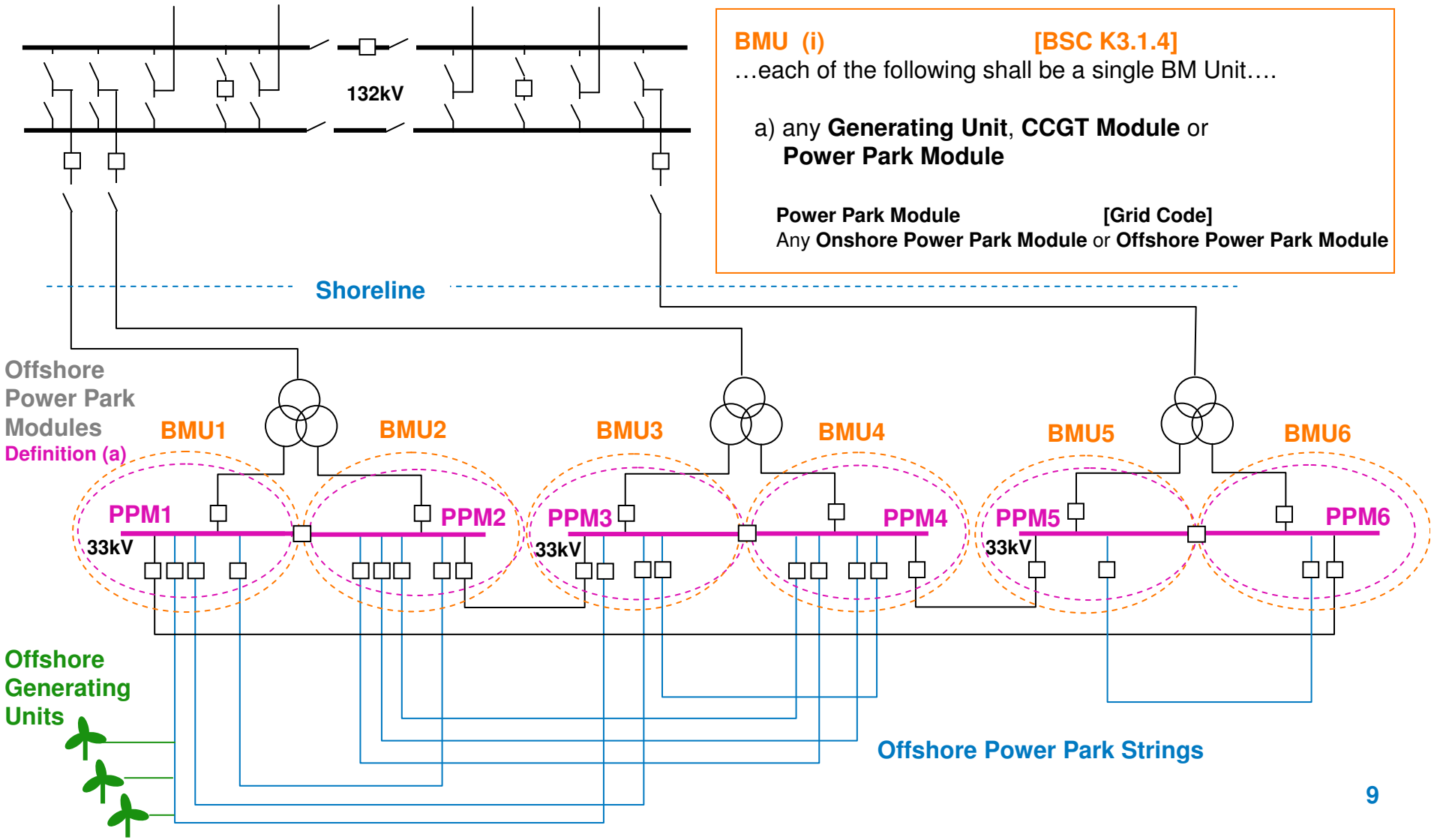
Offshore Network Definitions



BMU (i) **[BSC K3.1.4]**

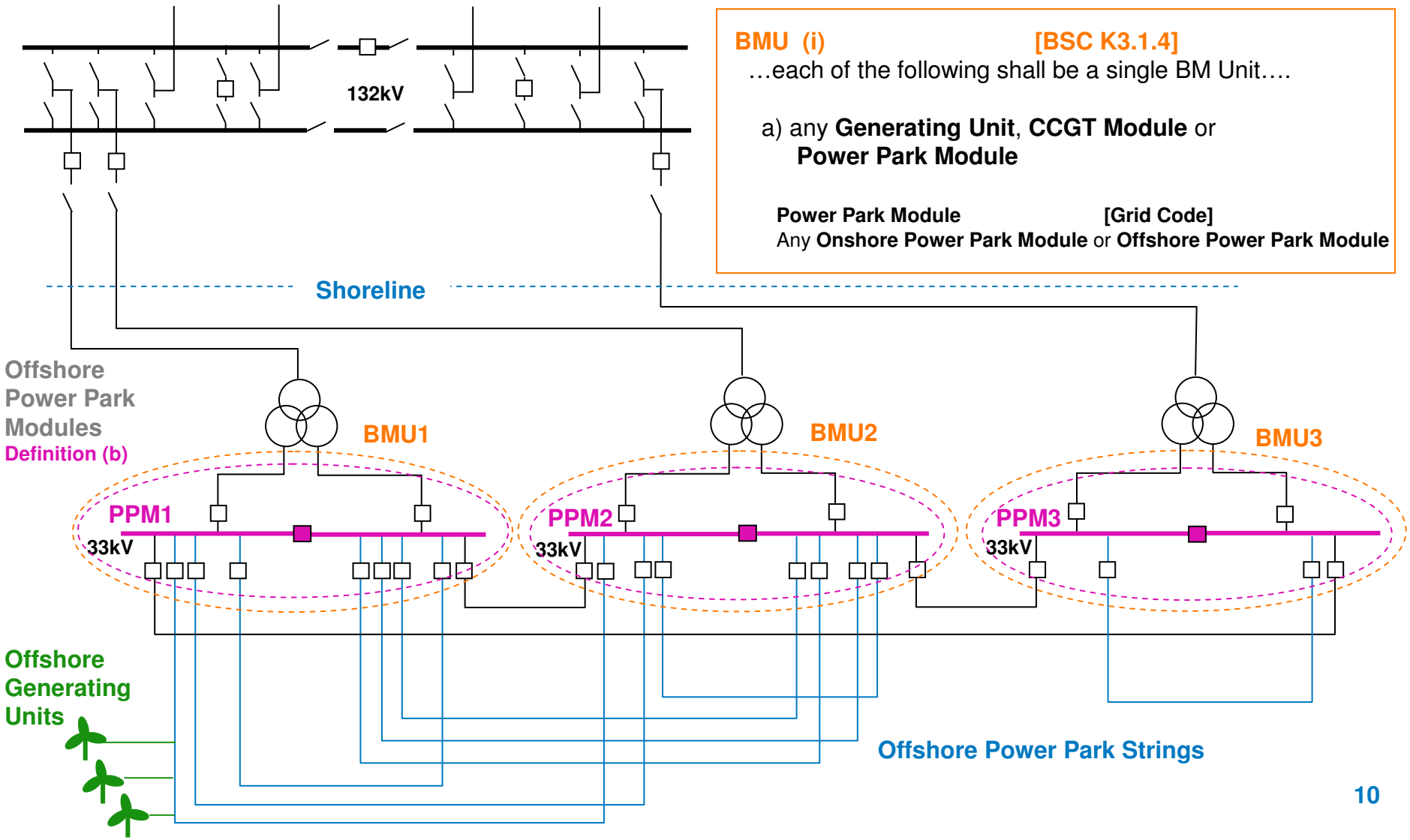
…each of the following shall be a single BM Unit….

a) any **Generating Unit**, **CCGT Module** or **Power Park Module**

Power Park Module **[Grid Code]**

Any **Onshore Power Park Module** or **Offshore Power Park Module**

Offshore Network Definitions



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Power Park Module **[Grid Code]**

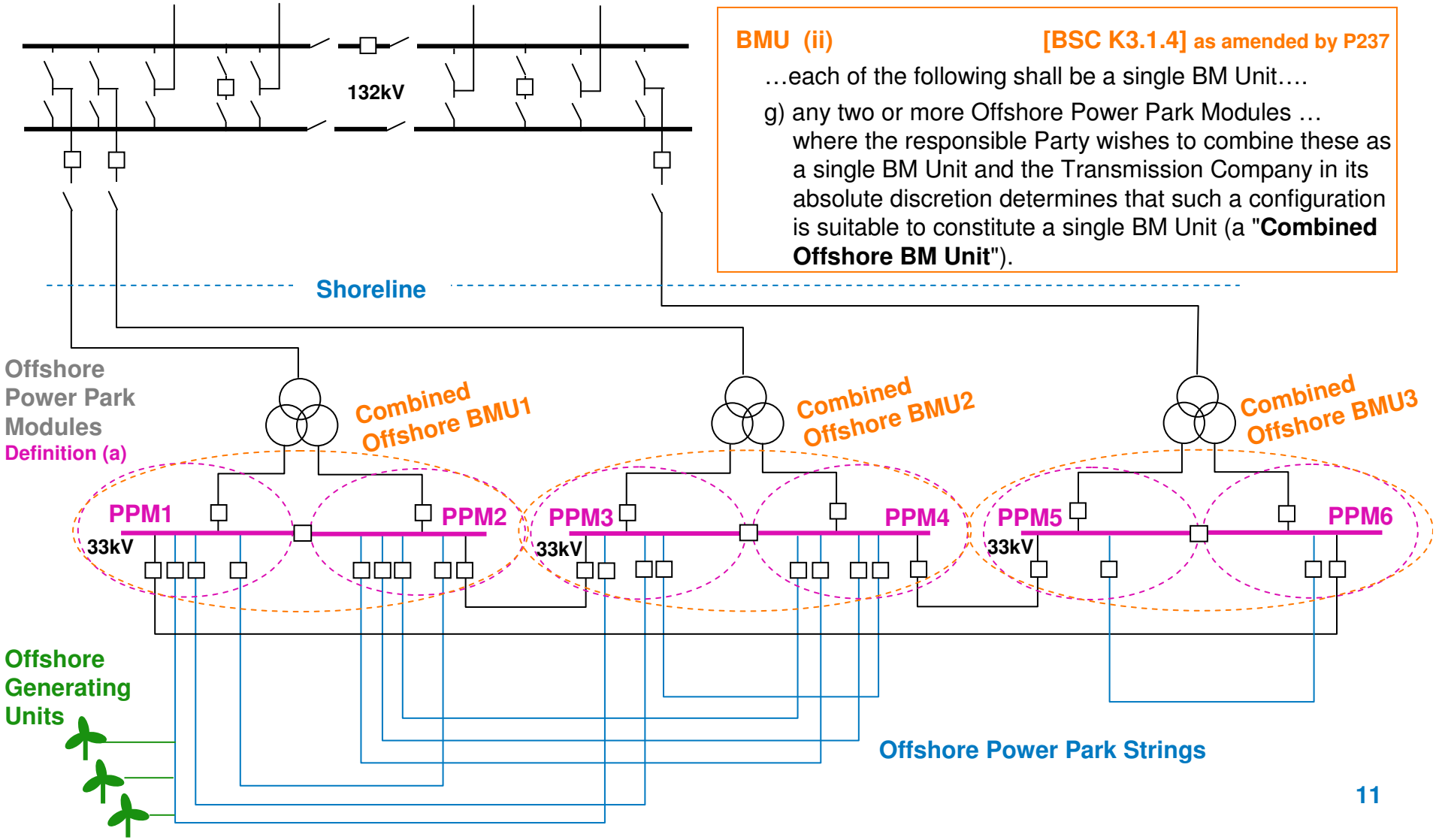
Any **Onshore Power Park Module** or **Offshore Power Park Module**

Offshore Network Definitions

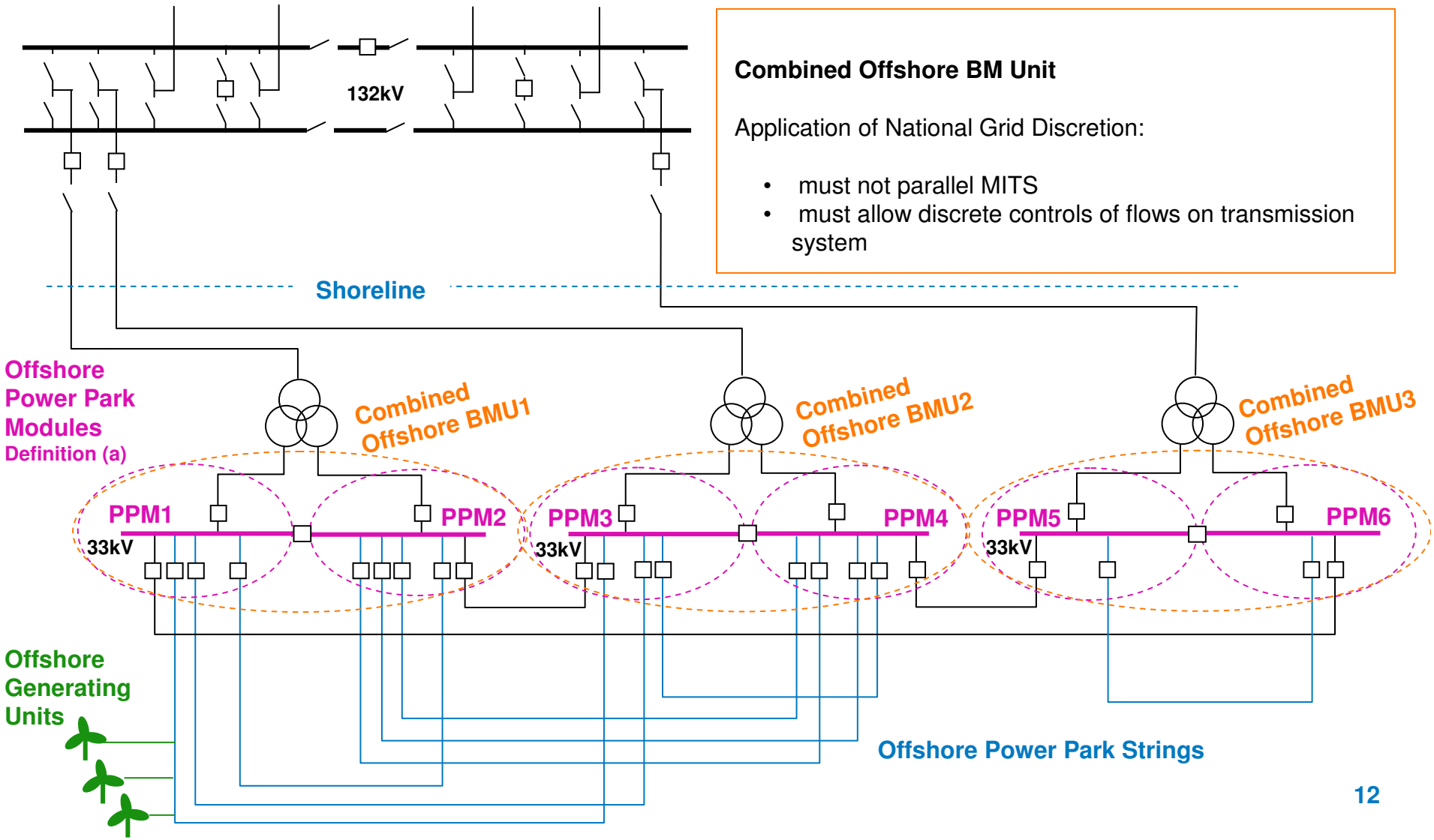
BMU (ii) **[BSC K3.1.4] as amended by P237**

…each of the following shall be a single BM Unit….

g) any two or more Offshore Power Park Modules … where the responsible Party wishes to combine these as a single BM Unit and the Transmission Company in its absolute discretion determines that such a configuration is suitable to constitute a single BM Unit (a "**Combined Offshore BM Unit**").



Offshore Network Definitions

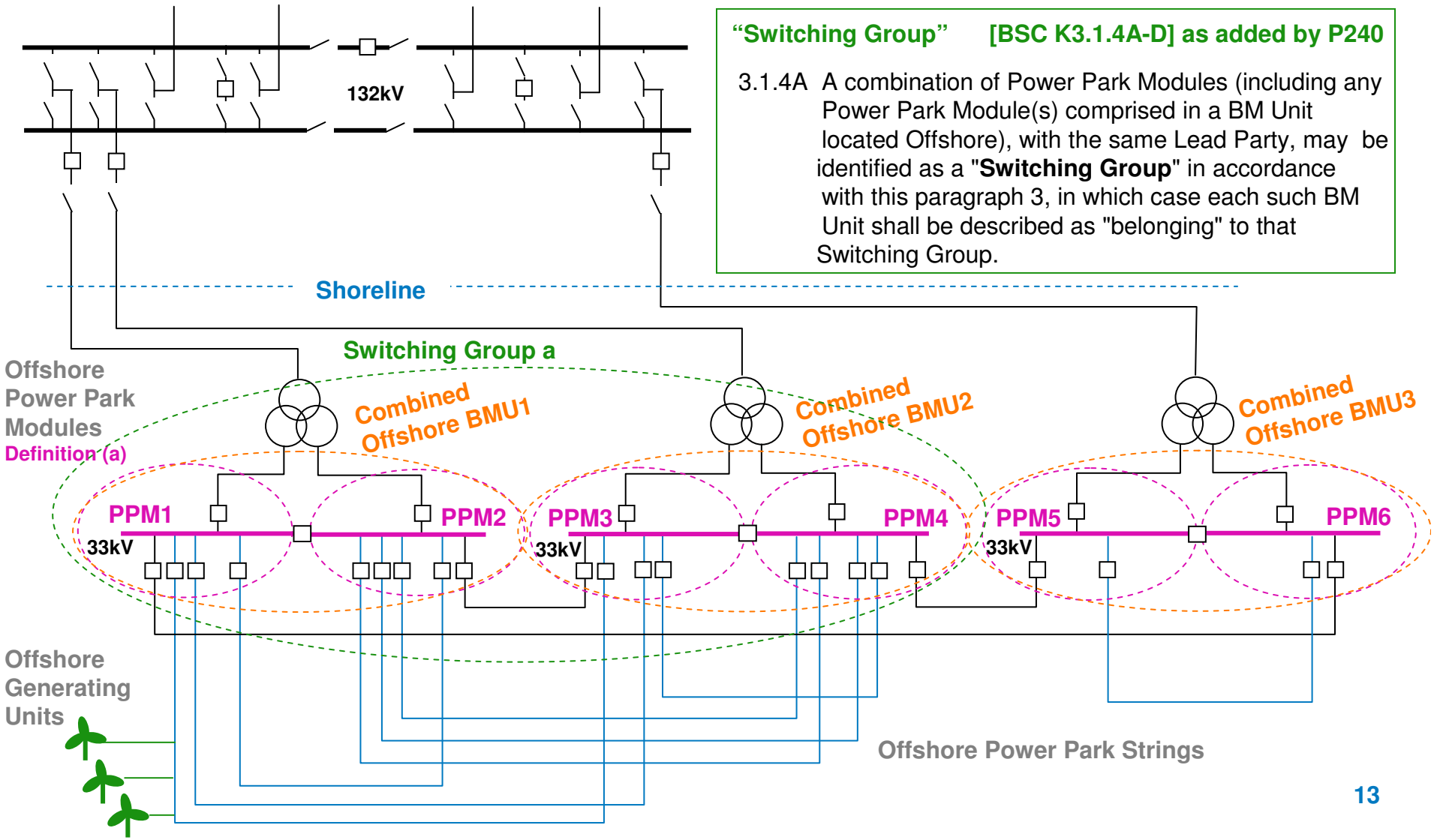


Combined Offshore BM Unit

Application of National Grid Discretion:

- must not parallel MITS
- must allow discrete controls of flows on transmission system

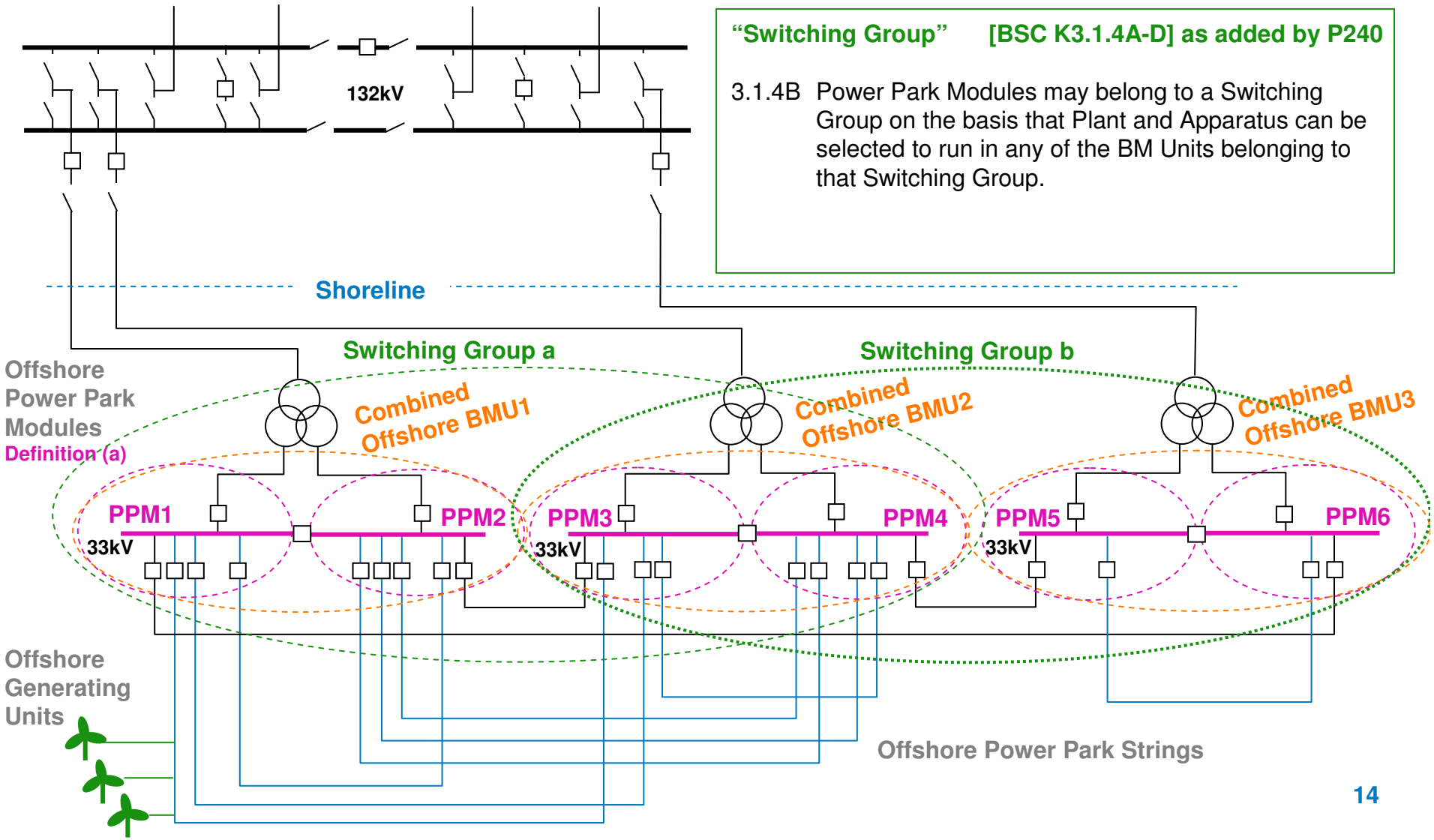
Offshore Network Definitions



"Switching Group" **[BSC K3.1.4A-D] as added by P240**

3.1.4A A combination of Power Park Modules (including any Power Park Module(s) comprised in a BM Unit located Offshore), with the same Lead Party, may be identified as a "**Switching Group**" in accordance with this paragraph 3, in which case each such BM Unit shall be described as "belonging" to that Switching Group.

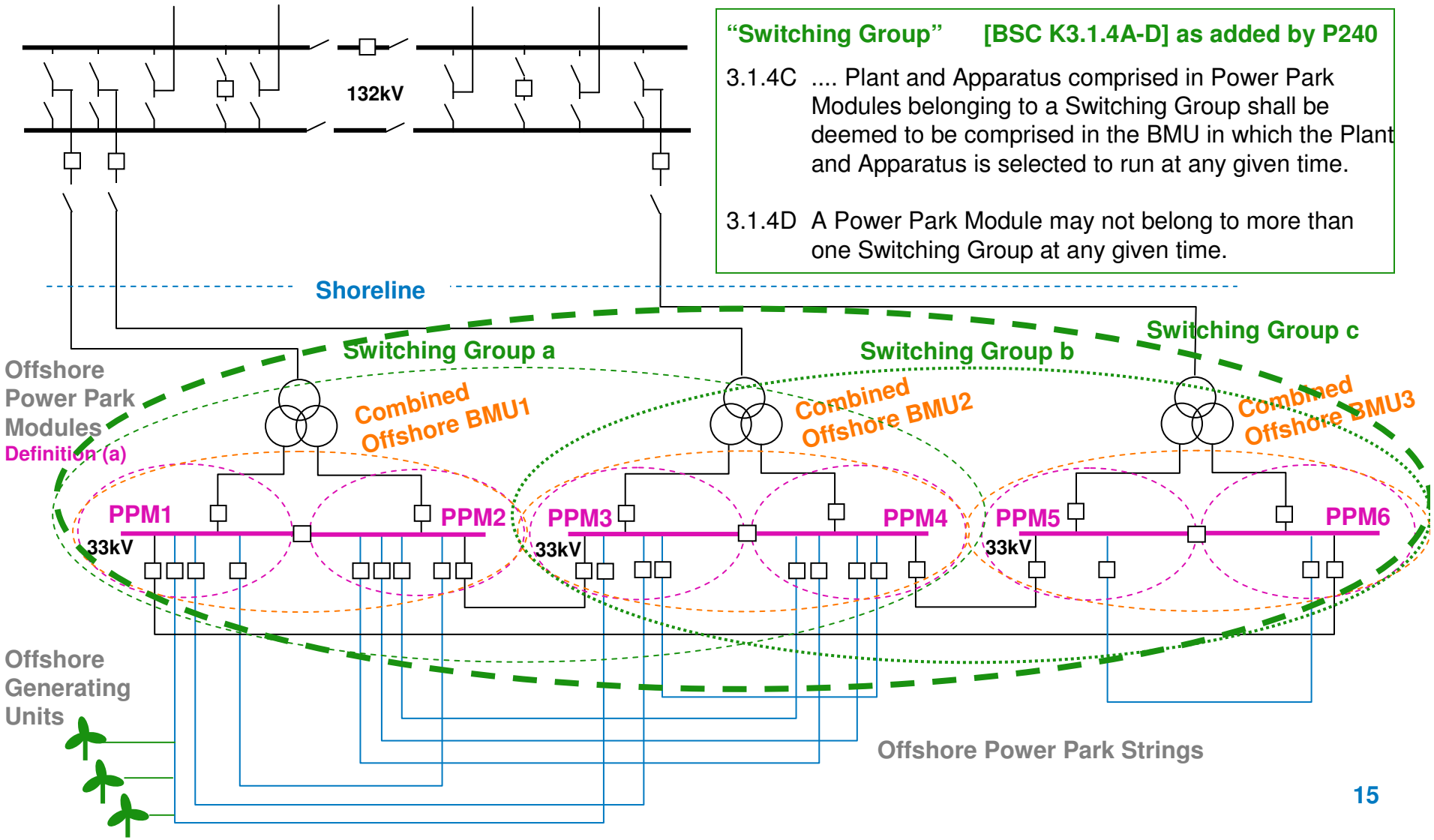
Offshore Network Definitions



"Switching Group" **[BSC K3.1.4A-D] as added by P240**

3.1.4B Power Park Modules may belong to a Switching Group on the basis that Plant and Apparatus can be selected to run in any of the BM Units belonging to that Switching Group.

Offshore Network Definitions



"Switching Group" **[BSC K3.1.4A-D] as added by P240**

3.1.4C .... Plant and Apparatus comprised in Power Park Modules belonging to a Switching Group shall be deemed to be comprised in the BMU in which the Plant and Apparatus is selected to run at any given time.

3.1.4D A Power Park Module may not belong to more than one Switching Group at any given time.

PPM Availabilty Matrix

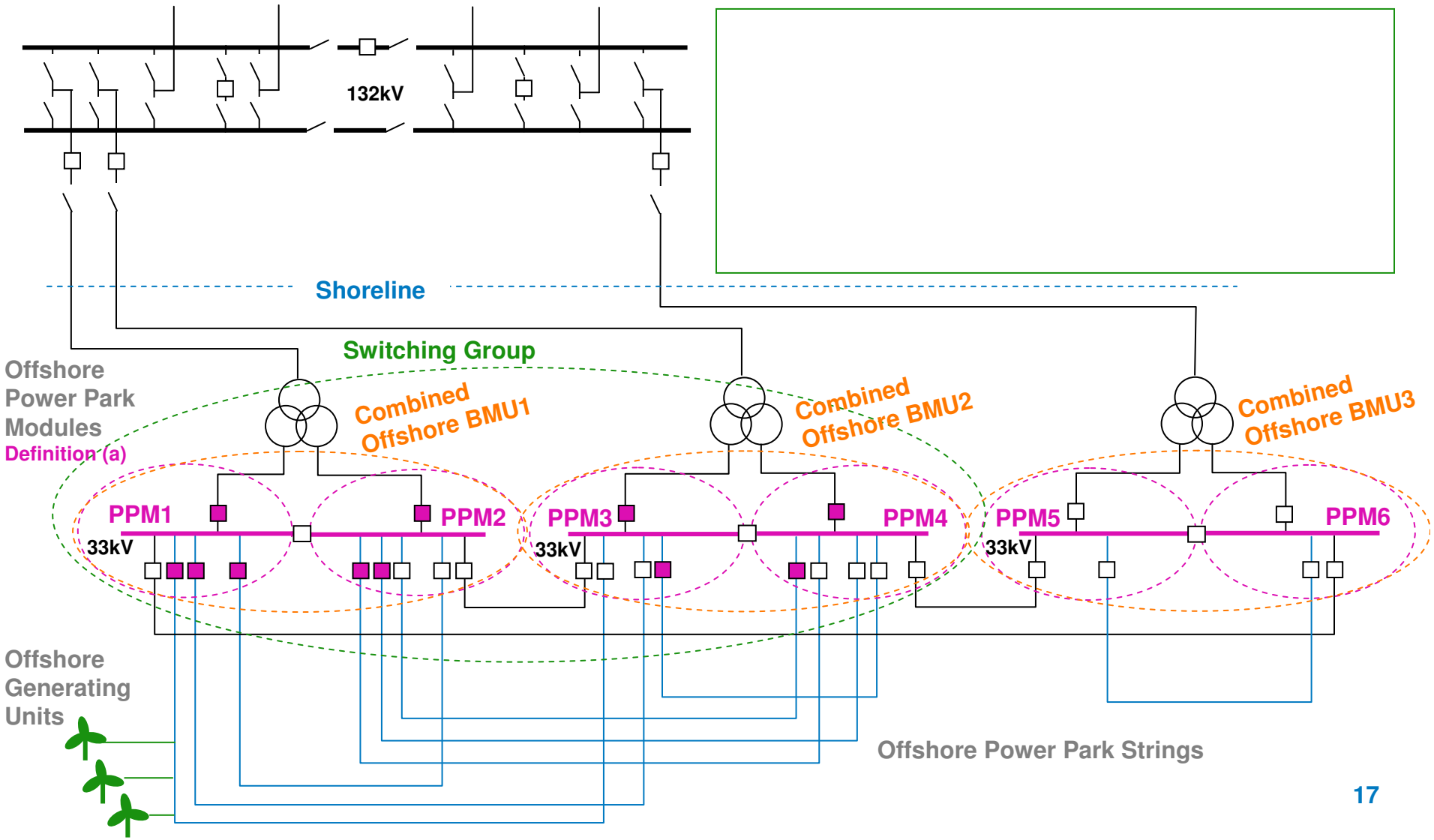
BC1.A.1.8 **Power Park Module Availability Matrix**

BC1.A.1.8.1 **Power Park Module Availability Matrix** showing the number of each type of **PowerPark Units** expected to be available is illustrated in the example form below. The **Power Park Module Availability Matrix** is designed to achieve certainty in knowing the number of **Power Park Units Synchronised** to meet the **Physical Notification** and to achieve a **Bid-Offer Acceptance**.

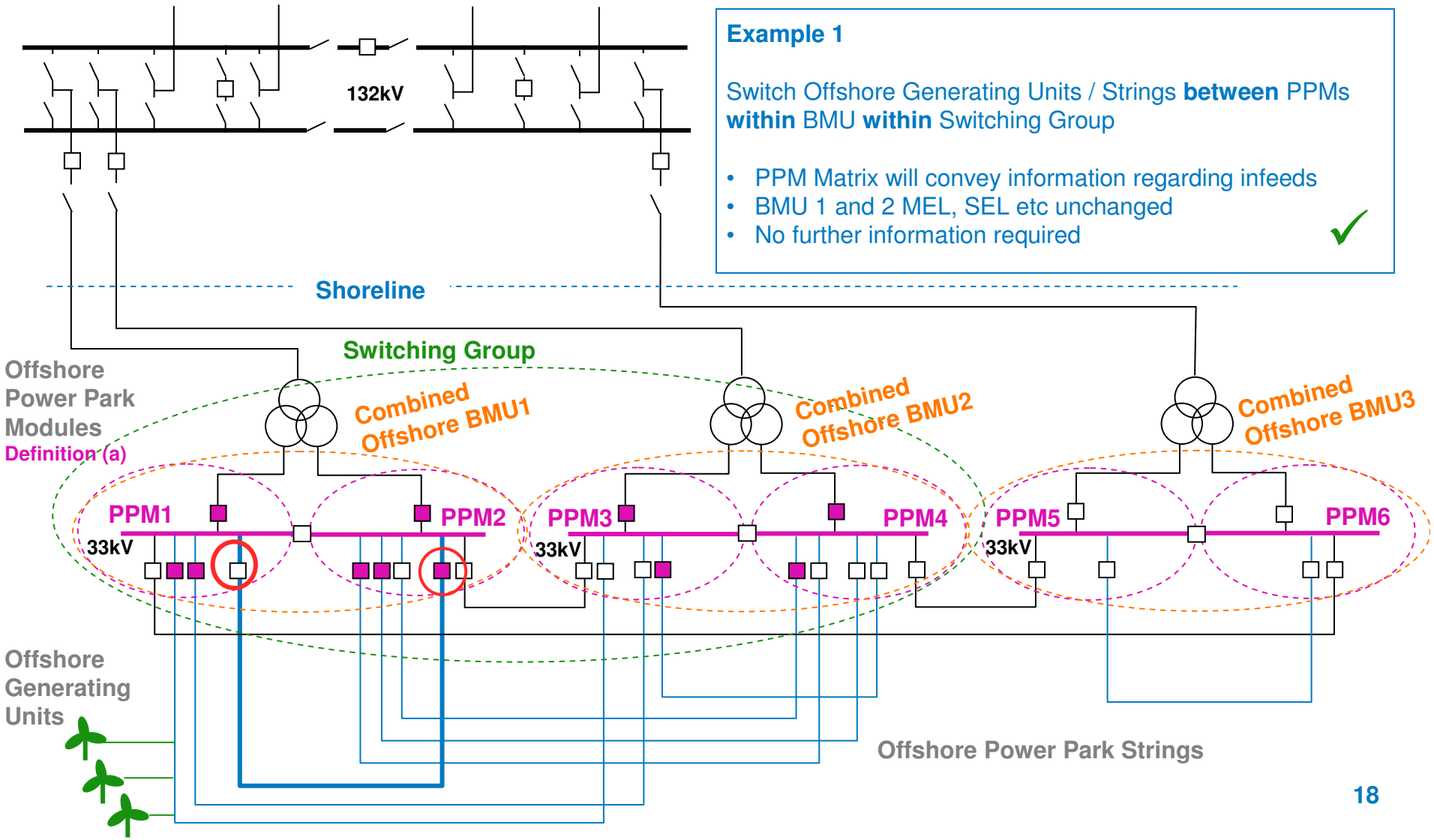
Power Park Module Availability Matrix example form

POWER PARK UNIT AVAILABILITY	**POWER PARK UNITS**			
	Type A	Type B	Type C	Type D
Description (Make/Model)				
Number of units				

Offshore Network Switching Examples



Offshore Network Switching Examples

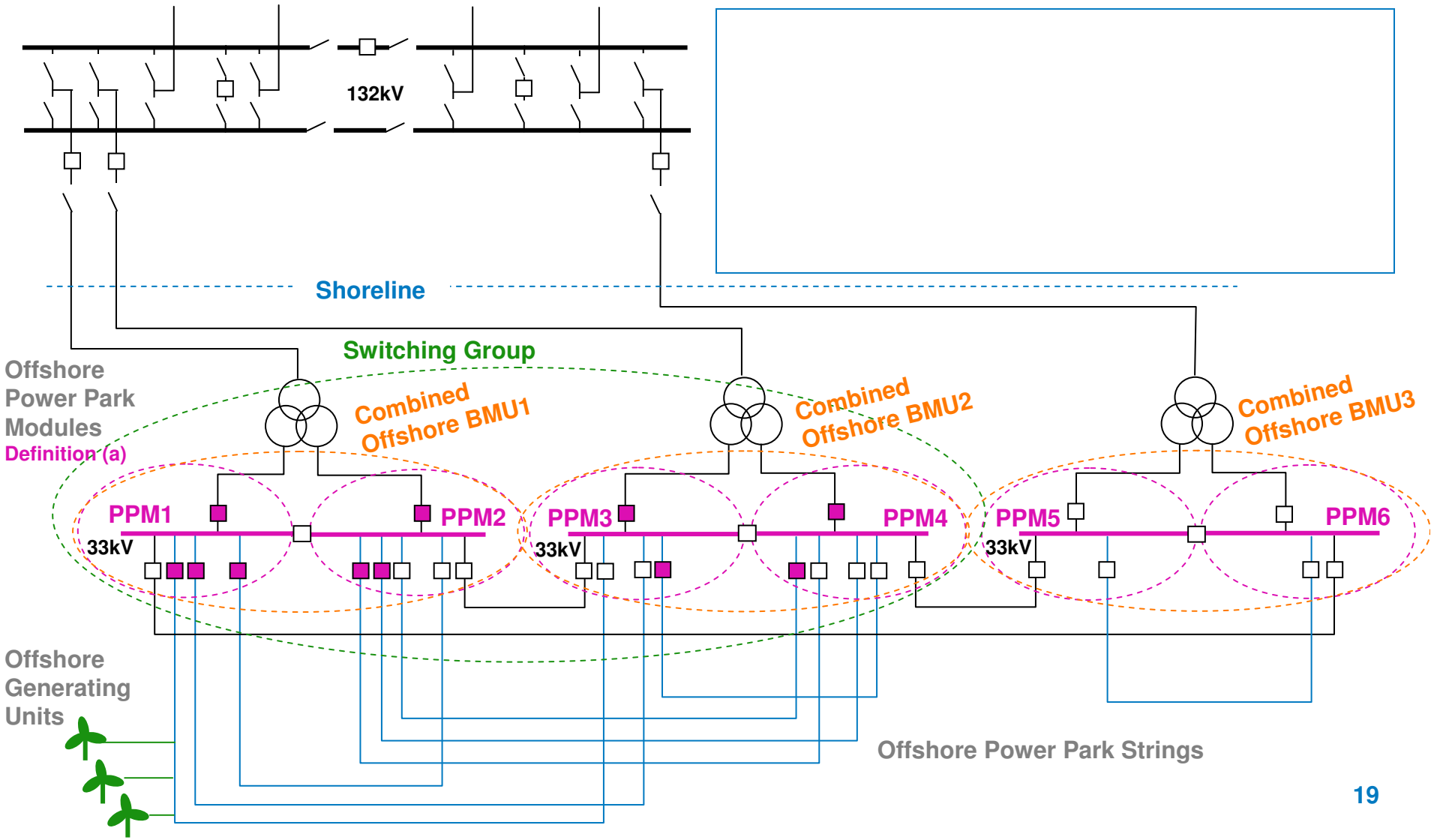


Example 1

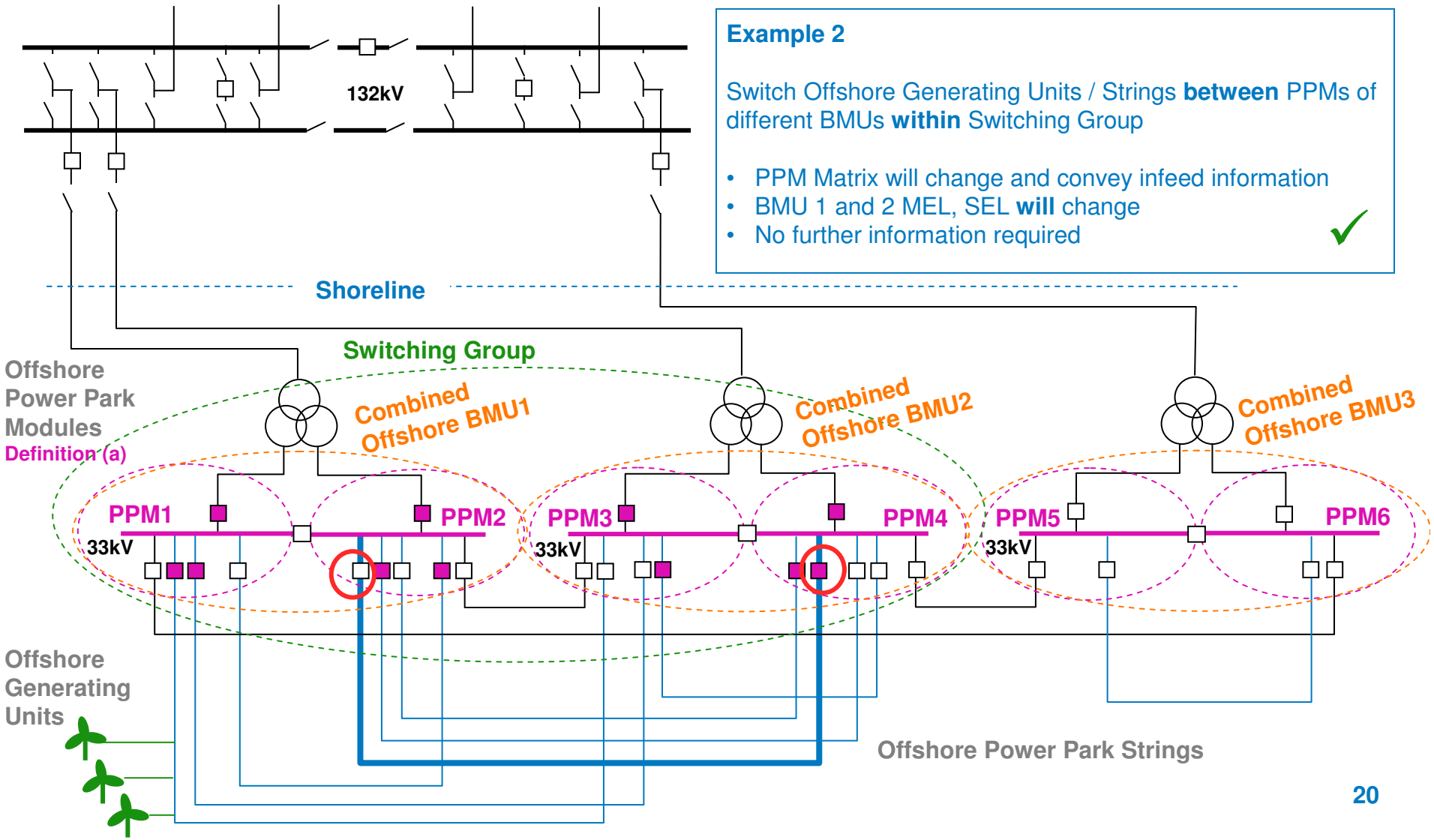
Switch Offshore Generating Units / Strings **between** PPMs **within** BMU **within** Switching Group

- PPM Matrix will convey information regarding infeeds
- BMU 1 and 2 MEL, SEL etc unchanged
- No further information required ✓

Offshore Network Switching Examples



Offshore Network Switching Examples

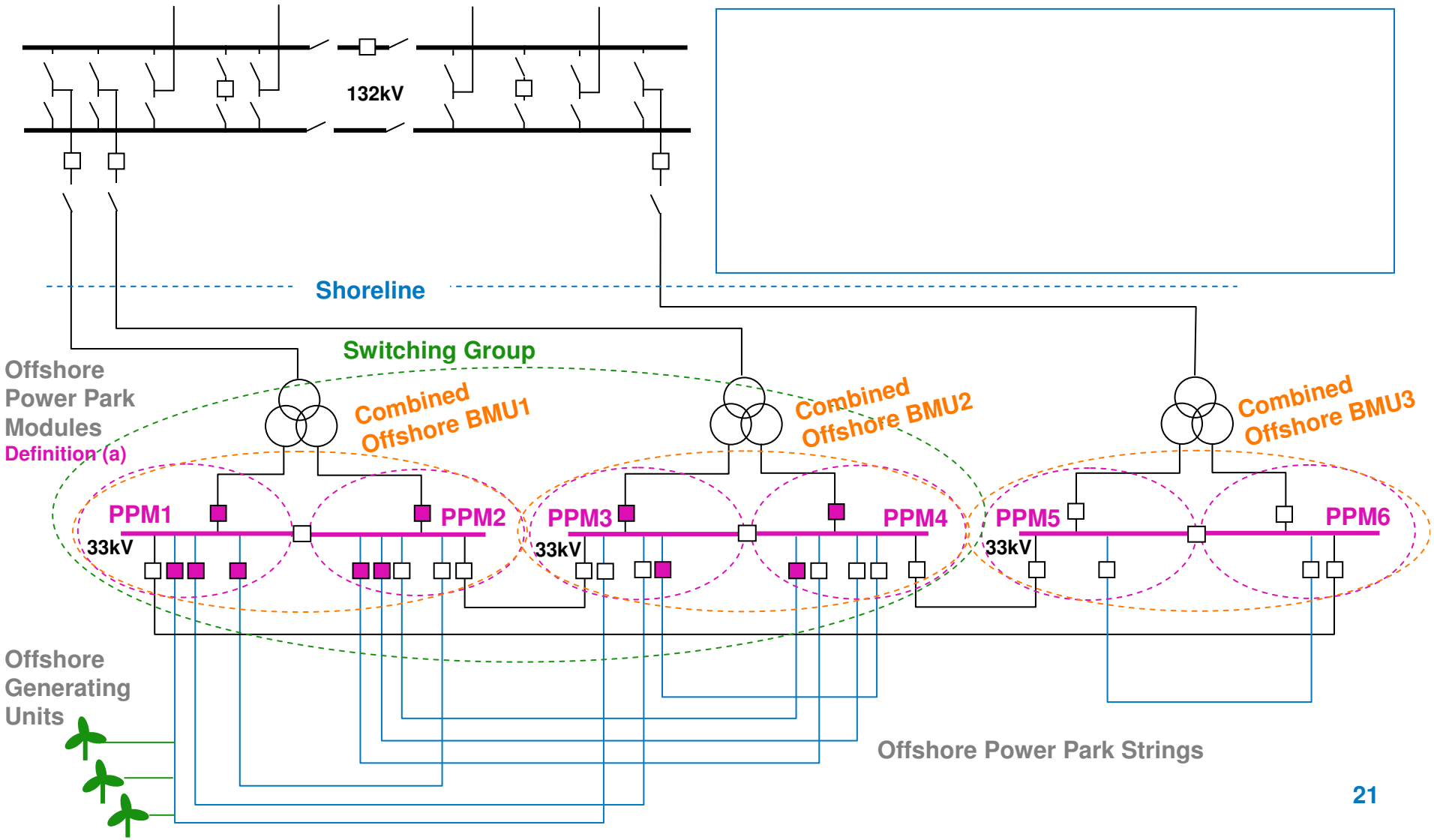


Example 2

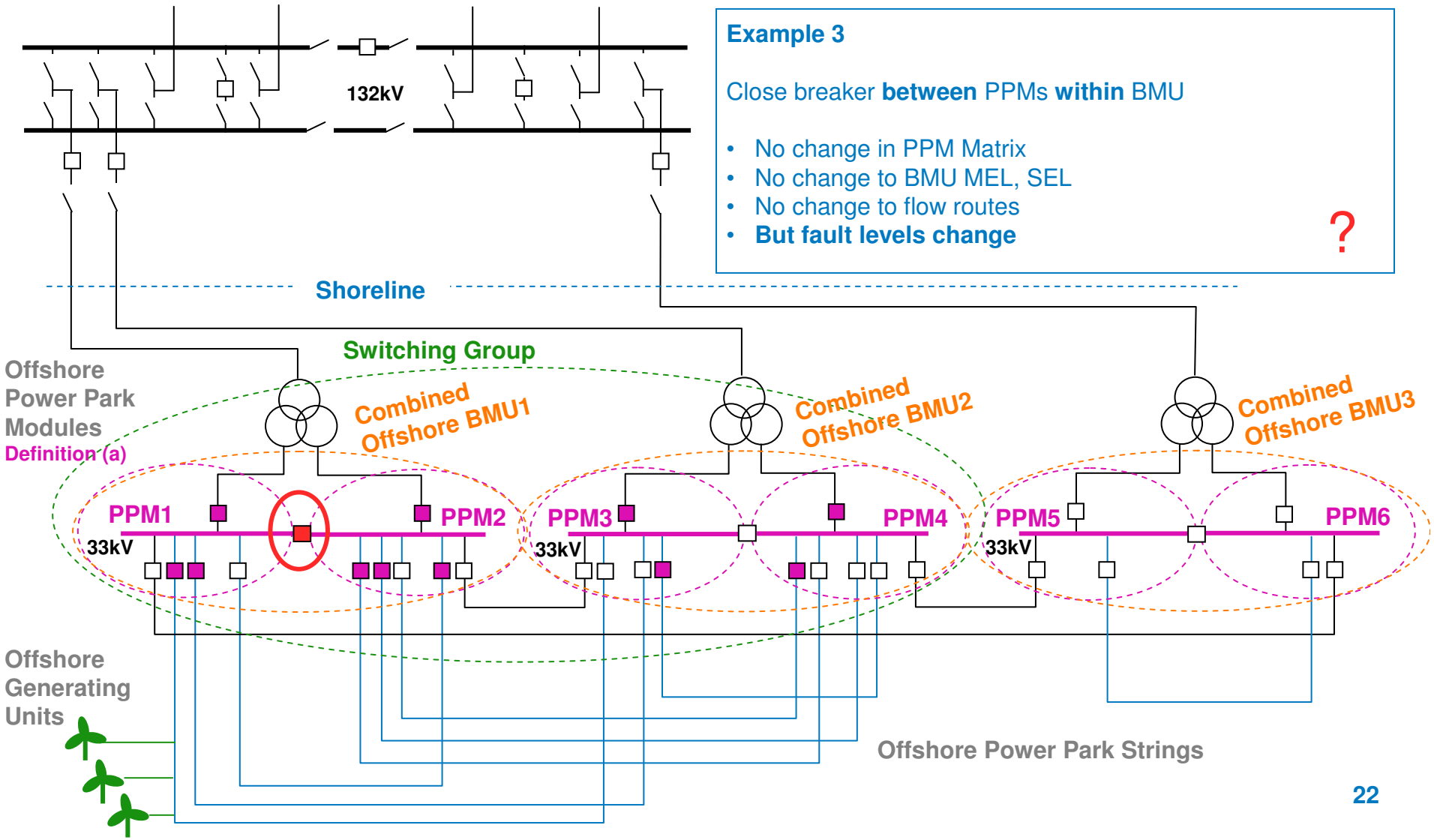
Switch Offshore Generating Units / Strings **between** PPMs of different BMUs **within** Switching Group

- PPM Matrix will change and convey infeed information
- BMU 1 and 2 MEL, SEL **will** change
- No further information required ✓

Offshore Network Switching Examples



Offshore Network Switching Examples



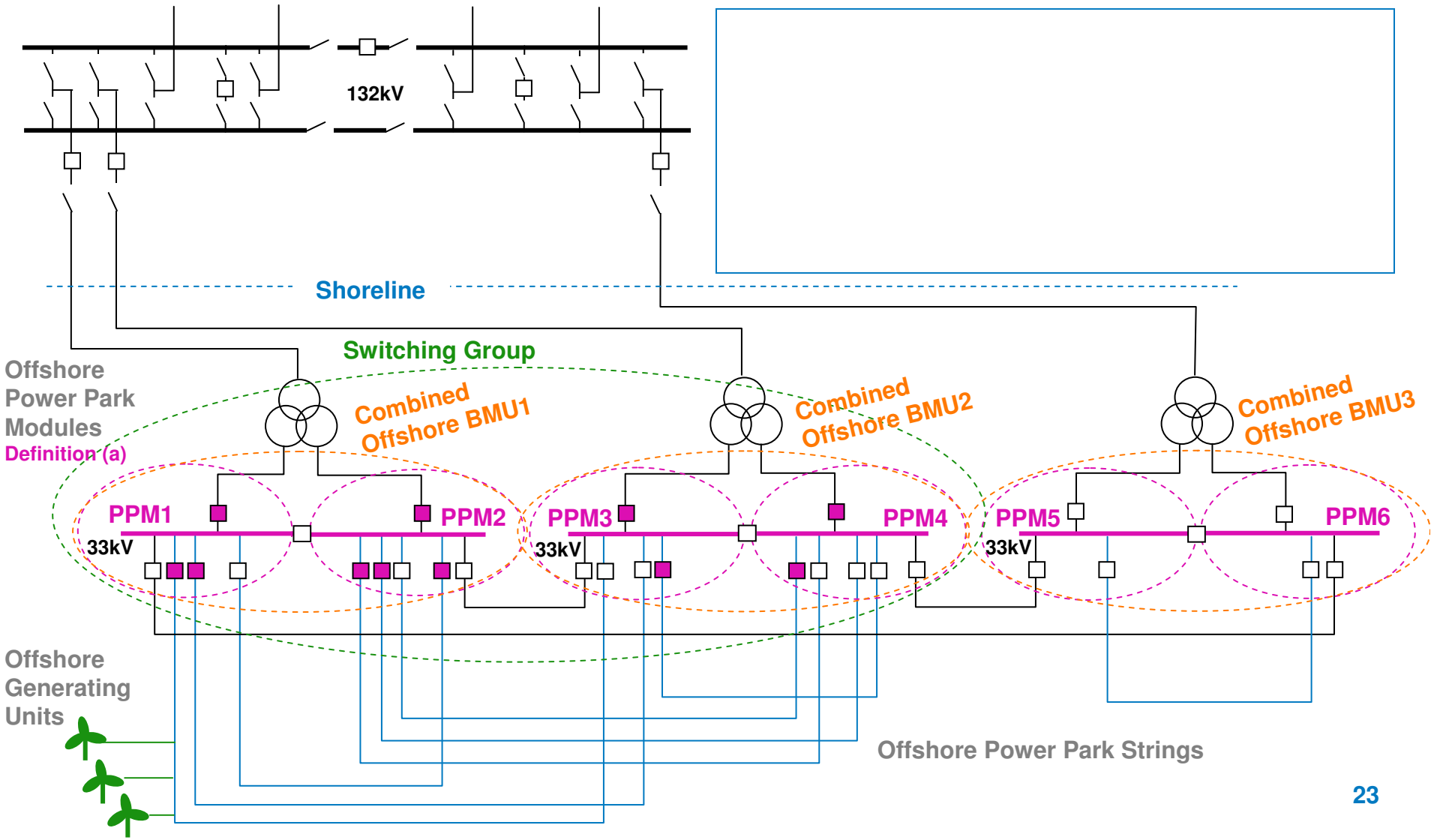
Example 3

Close breaker **between** PPMs **within** BMU

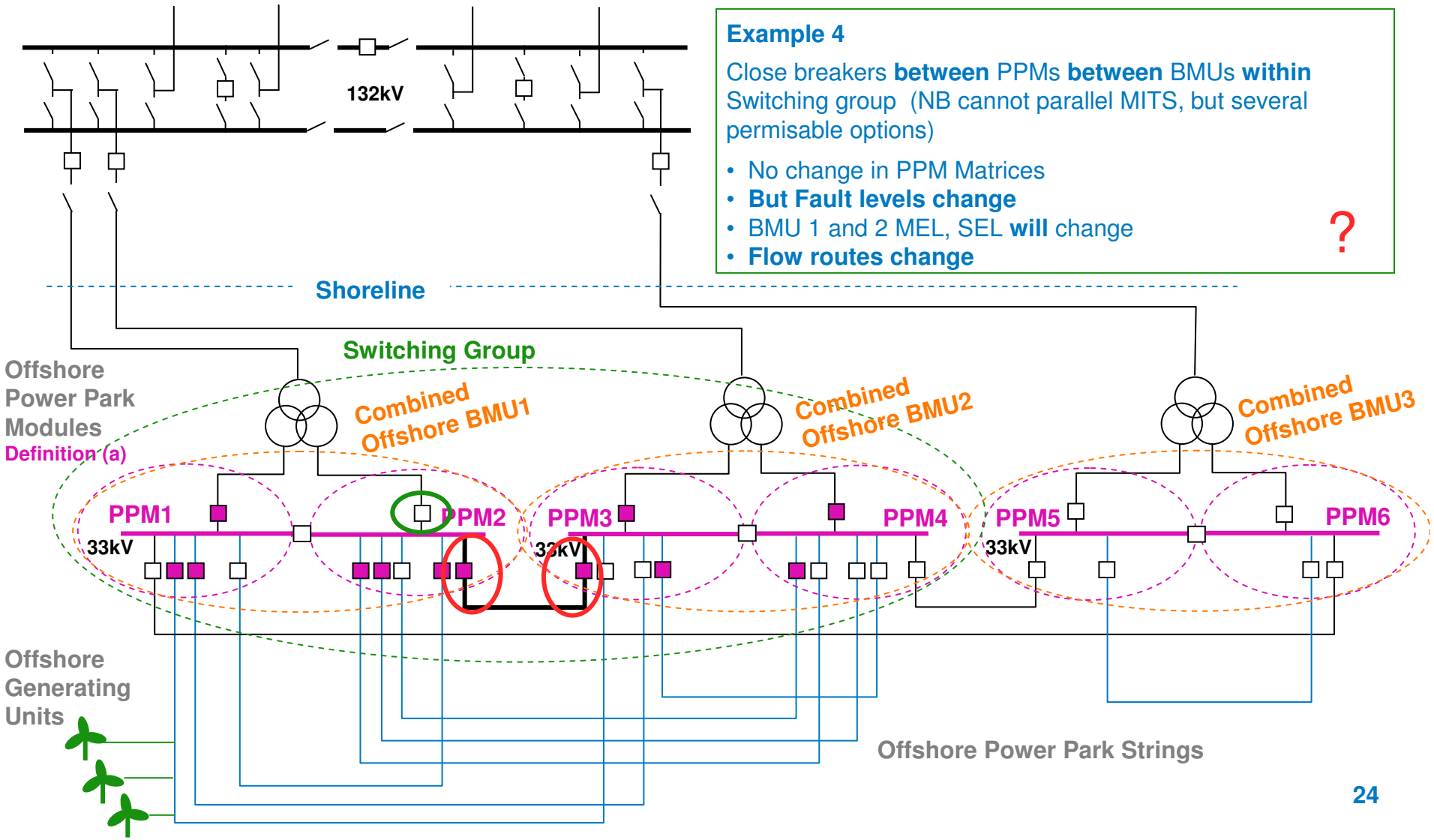
- No change in PPM Matrix
- No change to BMU MEL, SEL
- No change to flow routes
- **But fault levels change**

?

Offshore Network Switching Examples



Offshore Network Switching Examples



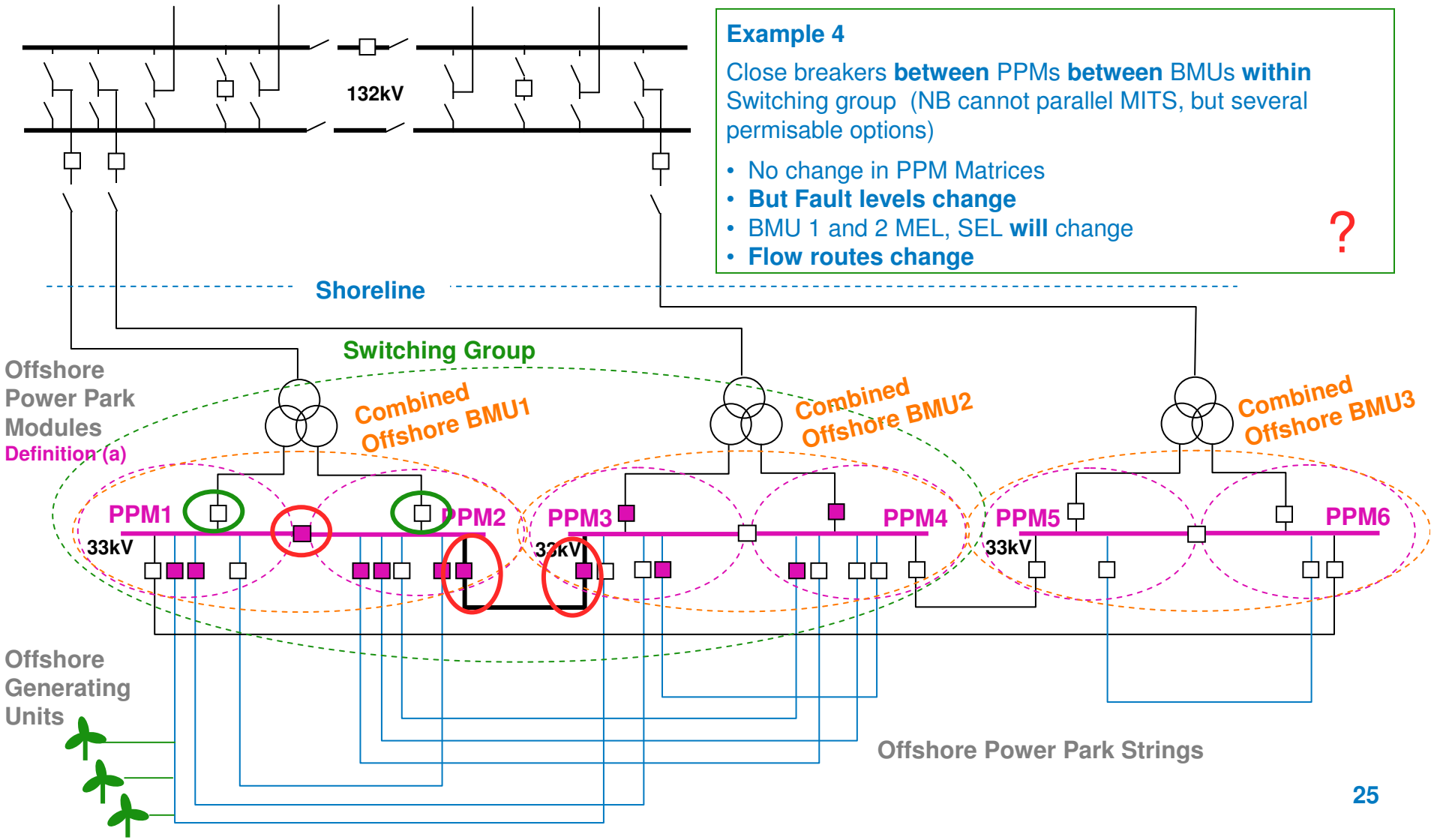
Example 4

Close breakers **between** PPMs **between** BMUs **within** Switching group (NB cannot parallel MITS, but several permisable options)

- No change in PPM Matrices
- **But Fault levels change**
- BMU 1 and 2 MEL, SEL **will** change
- **Flow routes change**

?

Offshore Network Switching Examples



Example 4

Close breakers **between** PPMs **between** BMUs **within** Switching group (NB cannot parallel MITS, but several permisable options)

- No change in PPM Matrices
- **But Fault levels change**
- BMU 1 and 2 MEL, SEL **will** change
- **Flow routes change**

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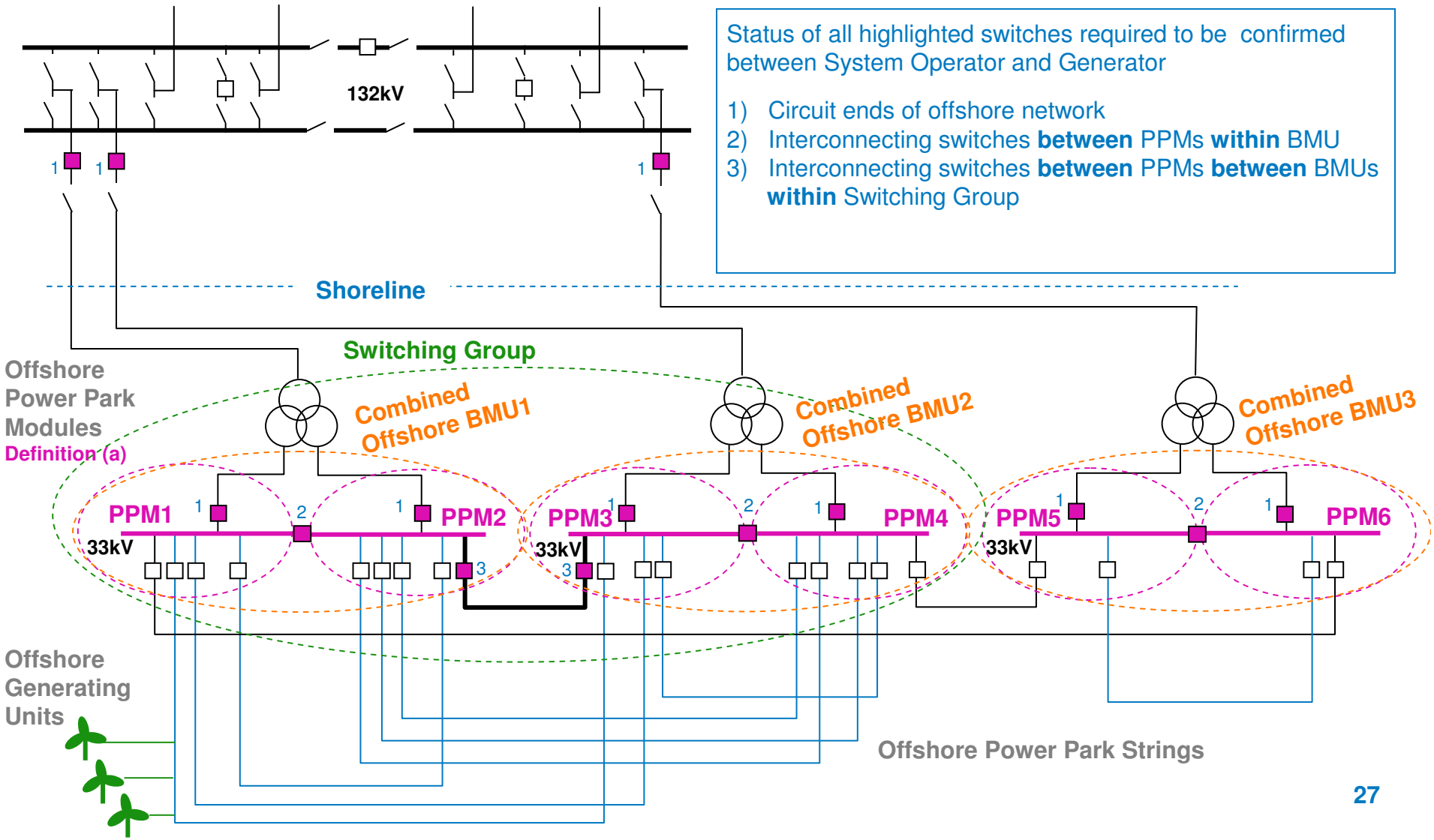
Offshore: System Operator role

- Need to:
  - Manage Transmission Flows (>=132kV)
    Achieve by Dispatching BMUs
    Therefore BMUs must discretely manage transmission flows
    BMUs Must not parallel MITS
    Must understand relationship of BMUs to flow routes
    - Configuration of BMUs required
  - Manage Fault Levels
    Need to know constitution of PPM and discrete fault infeeds
    - PPM Matrix states how many turbines of each type in each PPM
    - But what is configuration of PPMs within BMUs /Switching
    - Configuration of BMUs required
  - Coordinate switching
    Which switches?
    - Intended switch status of all switches System Operator operates

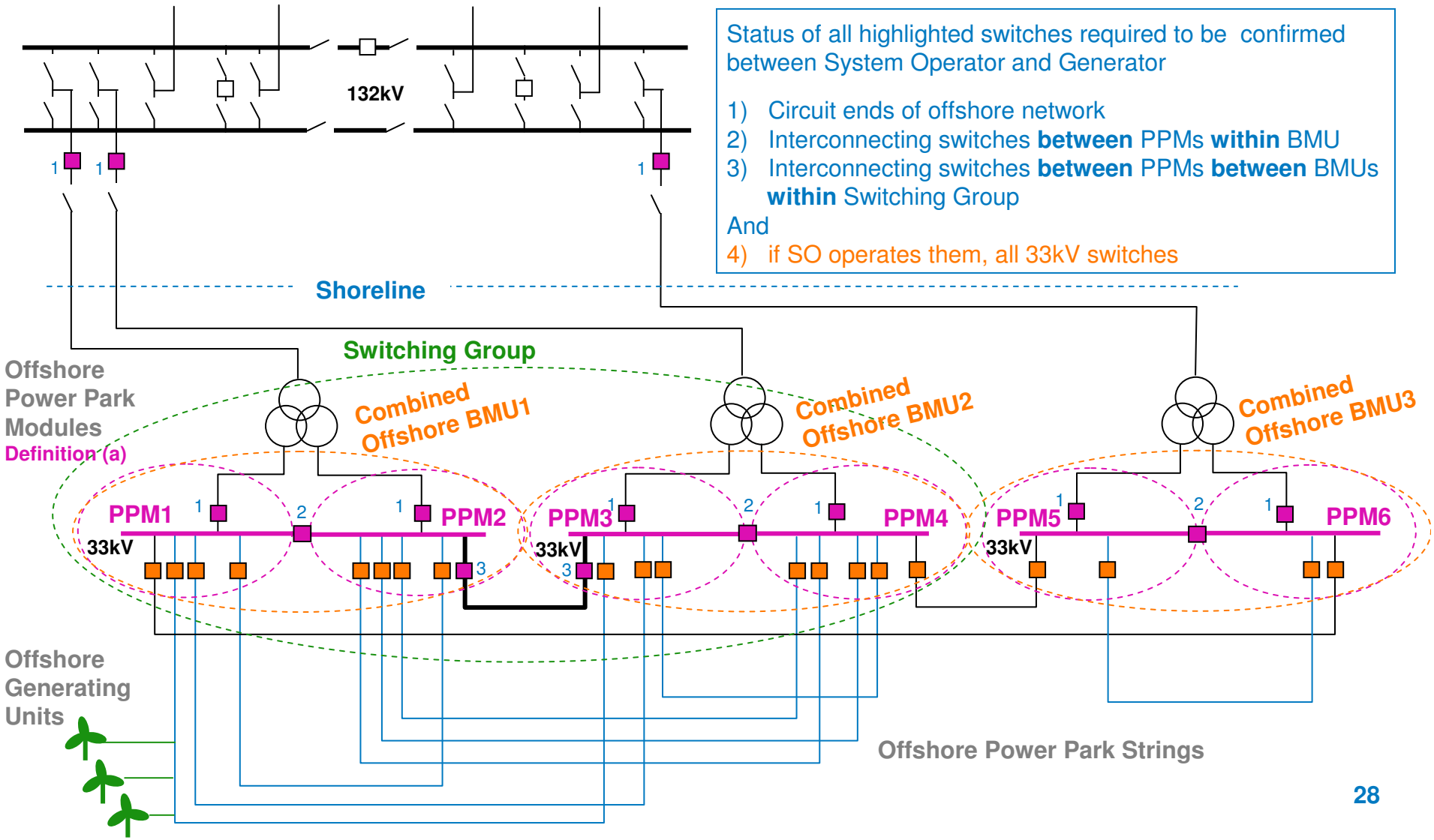
BMU Configuration Diagram



Status of all highlighted switches required to be confirmed between System Operator and Generator

1) Circuit ends of offshore network
2) Interconnecting switches **between** PPMs **within** BMU
3) Interconnecting switches **between** PPMs **between** BMUs **within** Switching Group

BMU Configuration Diagram



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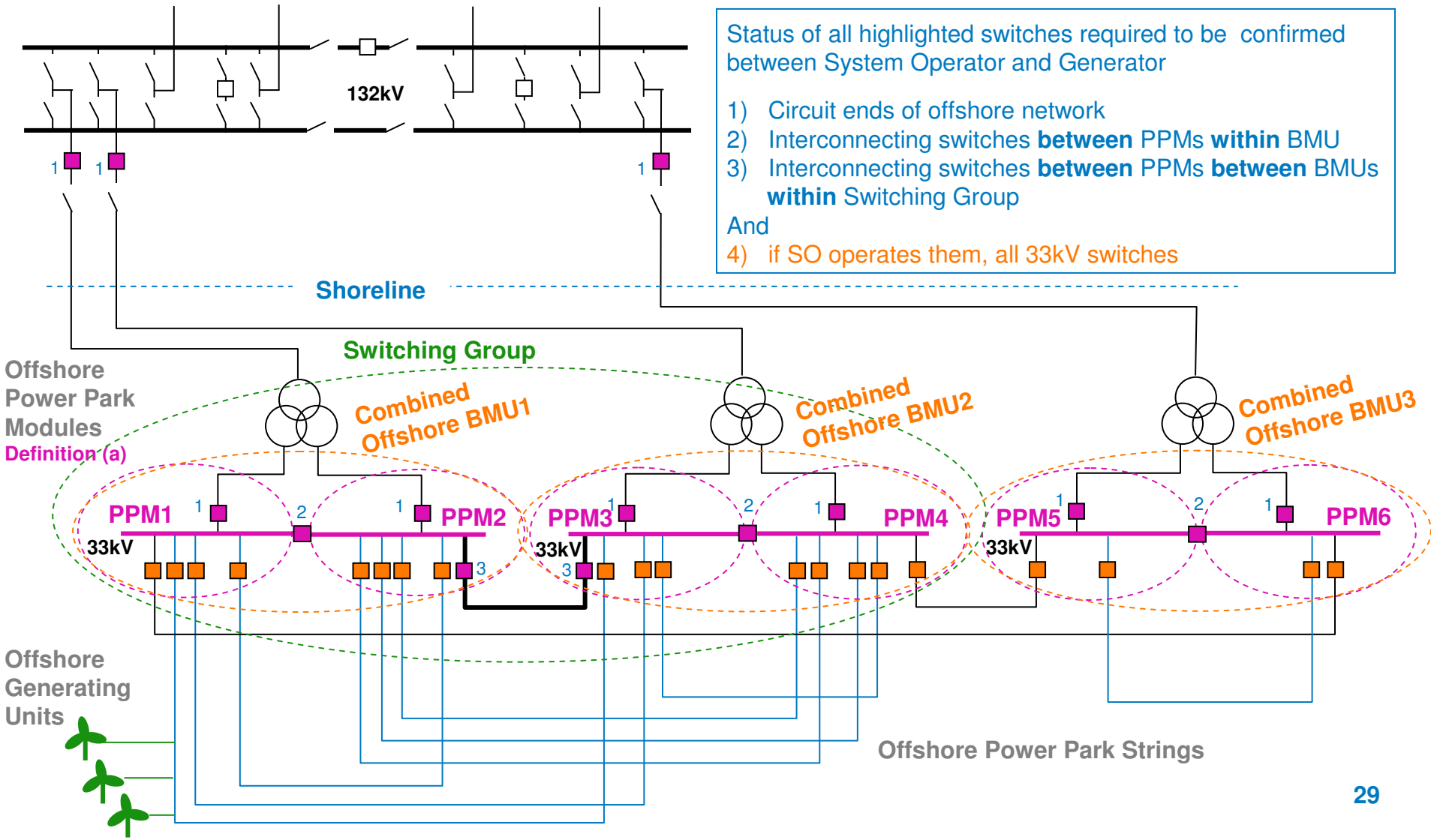
And

4) if SO operates them, all 33kV switches

BMU Configuration Diagram



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And

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BMU Configuration Diagram Process

- Standard configuration diagram to be agreed by National Grid and generator prior to BCAs being signed
- In operational timescales, National Grid and the generator will coordinate outages and determine whether any changes to the configuration (from standard) are required.
- Where changes are required, these will result in an Amended Configuration diagram, to be produced by National Grid. This will ideally be at week ahead; but by necessity may be at shorter timescales.
- The applicable configuration diagram, plus PPM matrix, will together provide the information required to allow the System Operators duties to be completed.

Proposed Grid Code Changes

- Regarding standard configuration:
  - Proposed Addition to OC2.4.2.1:
    (m) NGET and the generator shall agree a **Standard BMU Configuration** for the Offshore Power Park Module. NGET shall provide the generator with a **Standard BMU Configuration** Diagram to reflect the agreed standard configuration.
- Regarding amended configuration in operational timescales:
  - Proposed Addition to OC2.4.1.3.5:
    (iii) NGET will if necessary provide the relevant Generator with an **Amended BMU Configuration** Diagram showing changes to the **Standard BMU Configuration** for the following week. Subsequent changes to the BMU Configuation may be required to maintain secure and economic operation of the transmission system. Under these circumstances NGET will issue a revised diagram as soon as is reasonably practicable.
- New Grid Code definitions:
  - **Standard BMU Configuration** — The configuration agreed between the generator and National Grid
  - **Amended BMU Configuration** — The configuration agreed through the OC2 process to be adopted during fault or outage conditions