

**SPG
DRY
COOLING**



**Induced draft
ACC**

G.VANDEN BORRE

Member of



Portfolio of cooling solutions within the group

Dry Cooling Systems



Combined Cycle
Power Plant in
Europe



Combined Cycle
Power Plant in
Middle East



Combined Cycle
Power
Plant in UK



Waste Incineration
Plant in Europe



Solar Power Plant
In North Africa



Coal Fired Power
Plant – Indirect
Dry Cooling – In
China

Wet Cooling Systems



Field Erected
Cooling Tower
Class 1000
Concrete



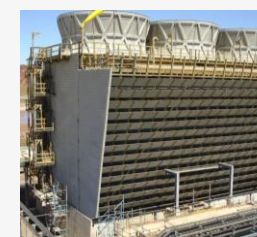
Field Erected
Natural Draft
Cooling Tower
Class 800



Field Erected
Cooling Tower
Class 400 & 800



Field Erected
Cooling Tower
Class 500 Wood



Field Erected
Cooling Tower
Class 600 Wood



Factory
Assembled
Products

SPG DRY COOLING - INDUCED DRAFT

A-Frame ACC



SPG DC Unique and patented

BoxAir ACC®



Induced Draft

<30 MWe

Hexacool®



Induced Draft

<75 MWe

W-Style ACC®



Induced Draft

All size

**SPG
DRY
COOLING**



W-Style® Technology



W-Style ACC™



Member of

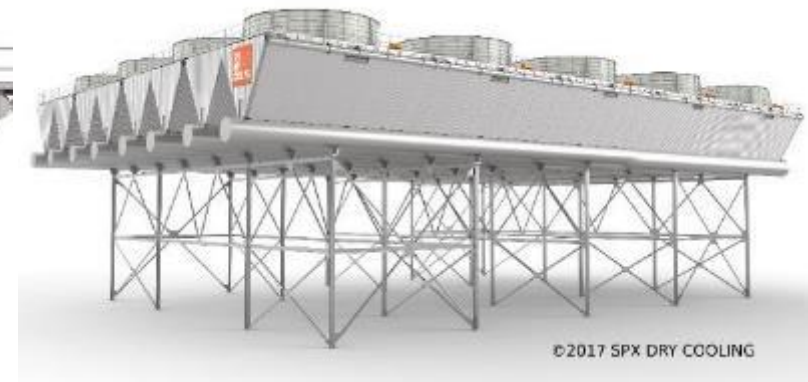


W-STYLE ACC® Description

W-Style ACC® is an induced Draft Air Cooled Condenser, with a “W” heat exchanger arrangement.

Features

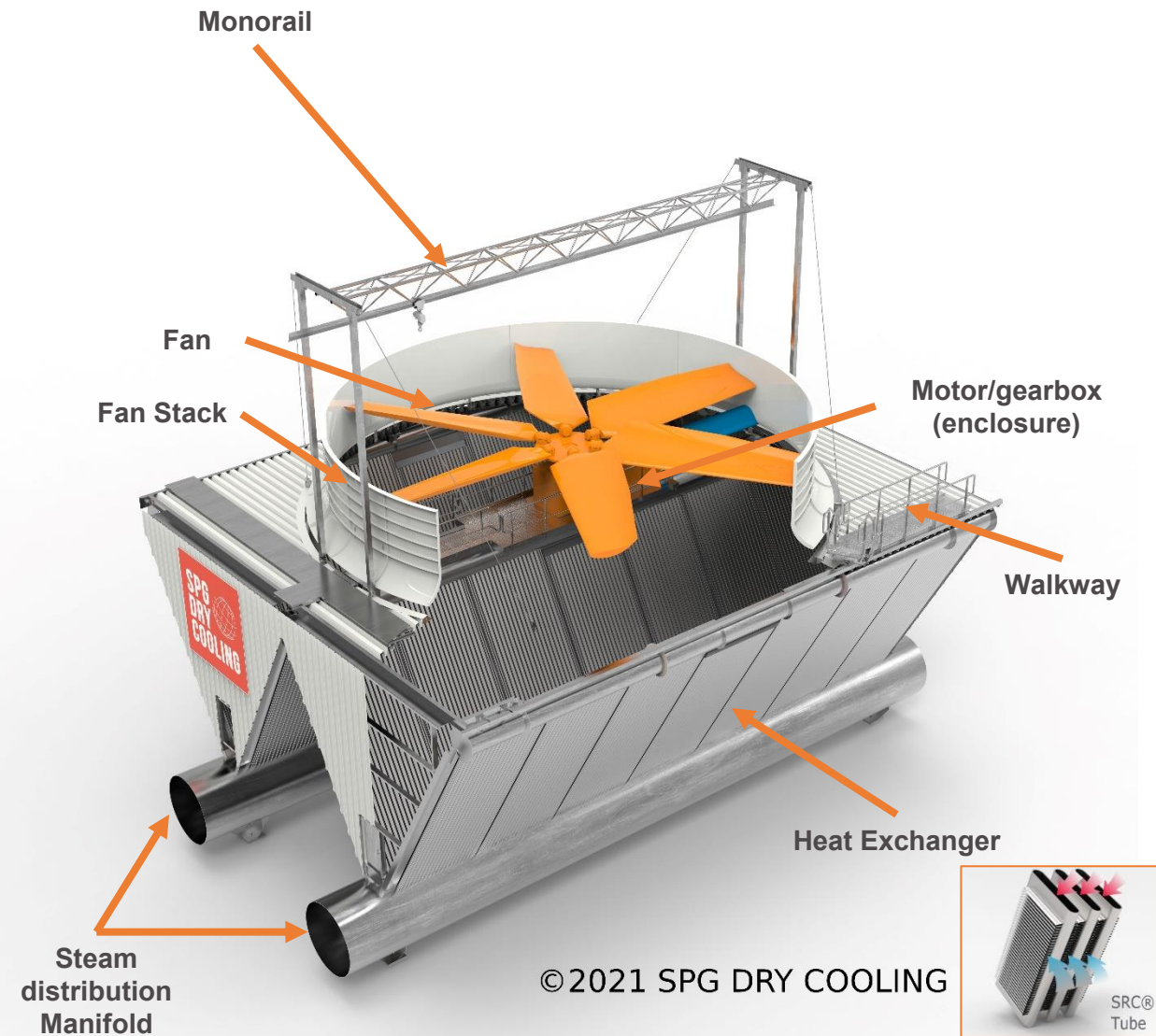
- Each street with 2 steam distribution manifolds at the bottom.
- Heat Exchanger arranged in W.
- Concrete or steel understructure supporting ACC modules.
- Flexibility in foundation localization and modules in cantilever.



W-STYLE ACC[®] Description

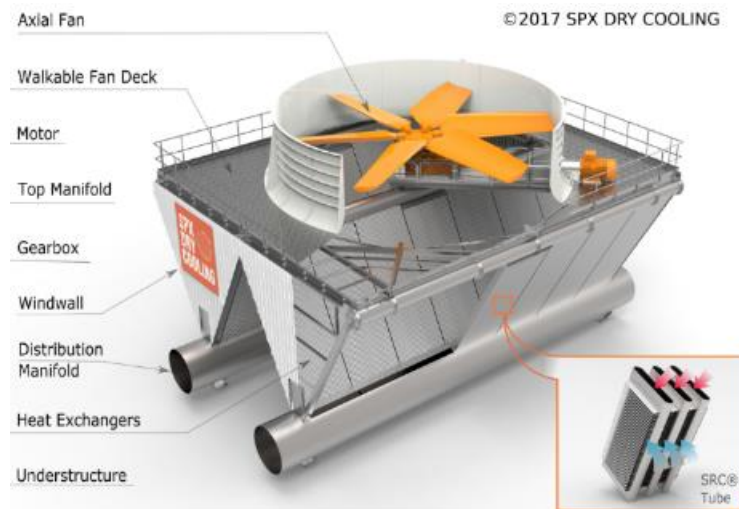
Features

- Heat Exchanger with state-of-the-art SRC[®] finned tubes.
- Fan deck level with perpendicular shaft Gearbox, Motor, Fan, Fan Bell on top of the exchanger.
- Short Fan bridge supported in the middle by the central top manifold.
- Fan deck fully accessible for maintenance ; walking area between bundles above the steam manifold for cleaning.



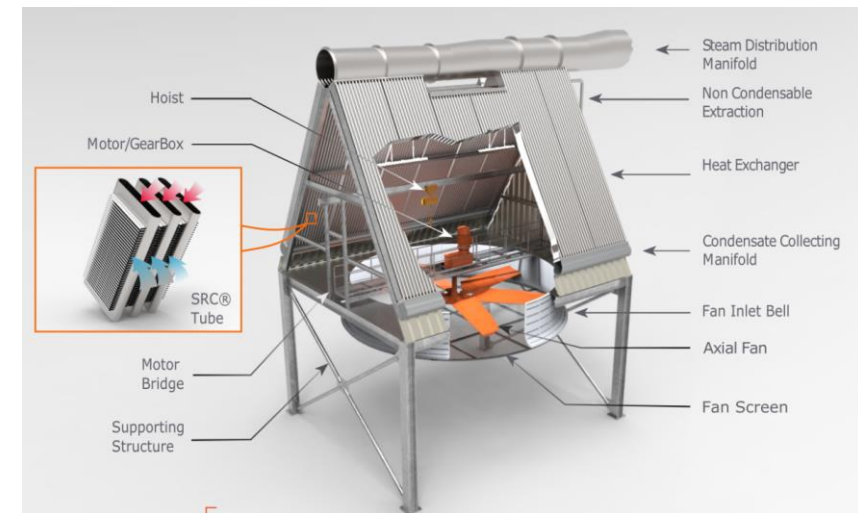
Induced Draft Configuration: Key Features and Benefits

W-Style®



- Induced Draft
- W-shaped fin tube configuration
- SRC Tubes

A-Frame



- Forced Draft
- A-shaped fin tube configuration
- SRC Tubes

Induced Draft Configuration: Key Features and Benefits

- Structural Design Concept
- Wind Impact and Hot Air Recirculation
- Subcooling & Performance Under Low-Temperature Conditions
- Noise Emission Levels

Structural Design Concept

W-Style®



- Light steel understructure with flexibility in supports location
- Bottom Steam Manifolds used as structural elements
- Independent understructure supports & streets offer flexibility in erection sequence

A-Frame



- A-shaped fin tube configuration
- Heavy steel structure Steel understructure
- Dependent understructure limiting erection sequence possibility

Structural Design Concept

W-Style®



- Light understructure to erect
- W assembled at grade
- Lower volume of scaffolding

A-Frame



- Heavier Steel understructure to be erected
- More work at height

Wind Impact and Hot Air Recirculation

The two main negative effects of wind on an ACC performances are improved with Induced Draft ACC:

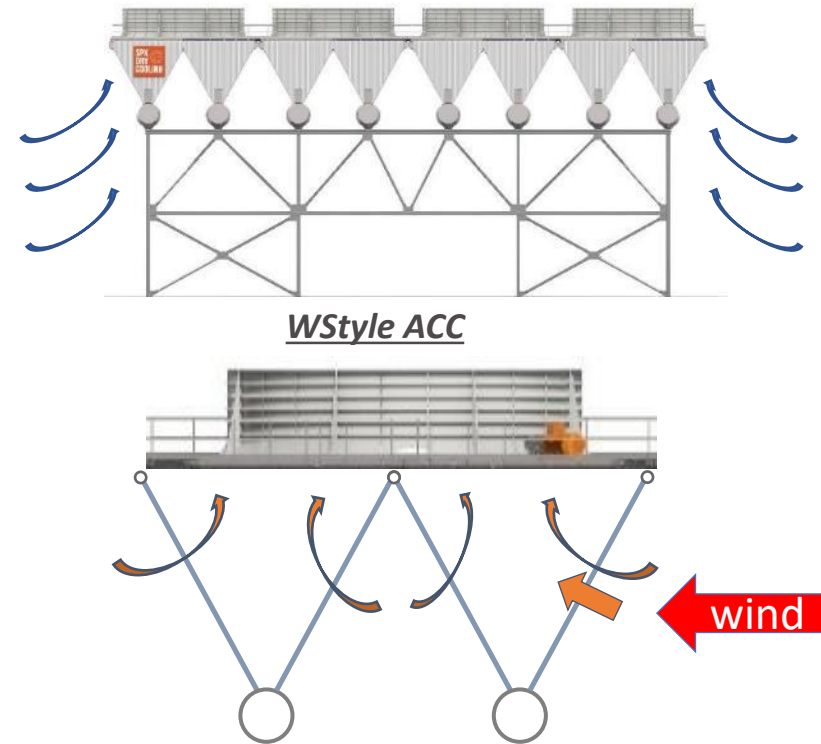
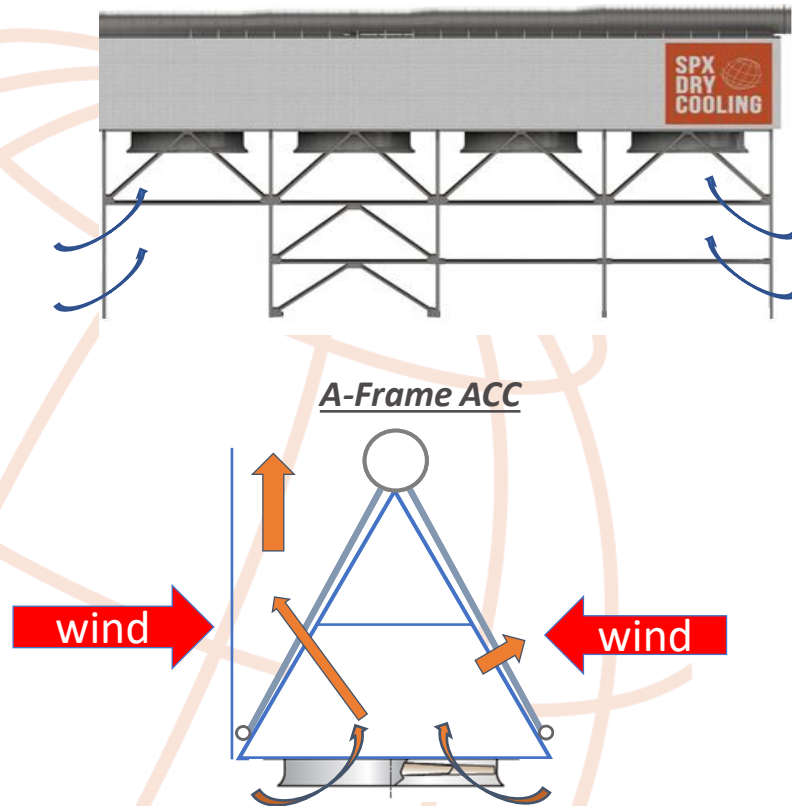
1. Recirculation of hot air exiting the ACC

- Significantly higher exit air velocity in the case of the Induced draft design

2. Reduction of fan air flow due to disturbance at air inlet

- Fan inlet protected from cross wind by the bundles acting like a screen for the W-Style design

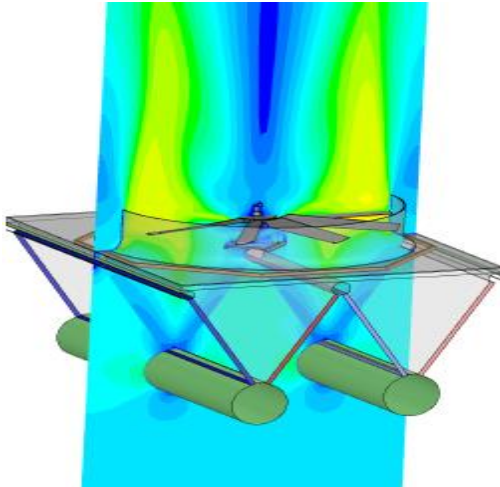
Wind Impact and Hot Air Recirculation



- A-Frame Windwall prevent that wind blowing prevent air to go out of the bundles
- W-Style Wind is blowing at same direction that the air sucked by the fan

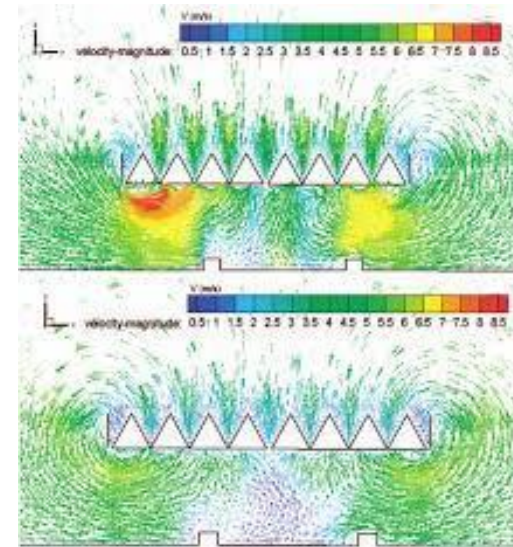
Wind Impact and Hot Air Recirculation

W-Style®



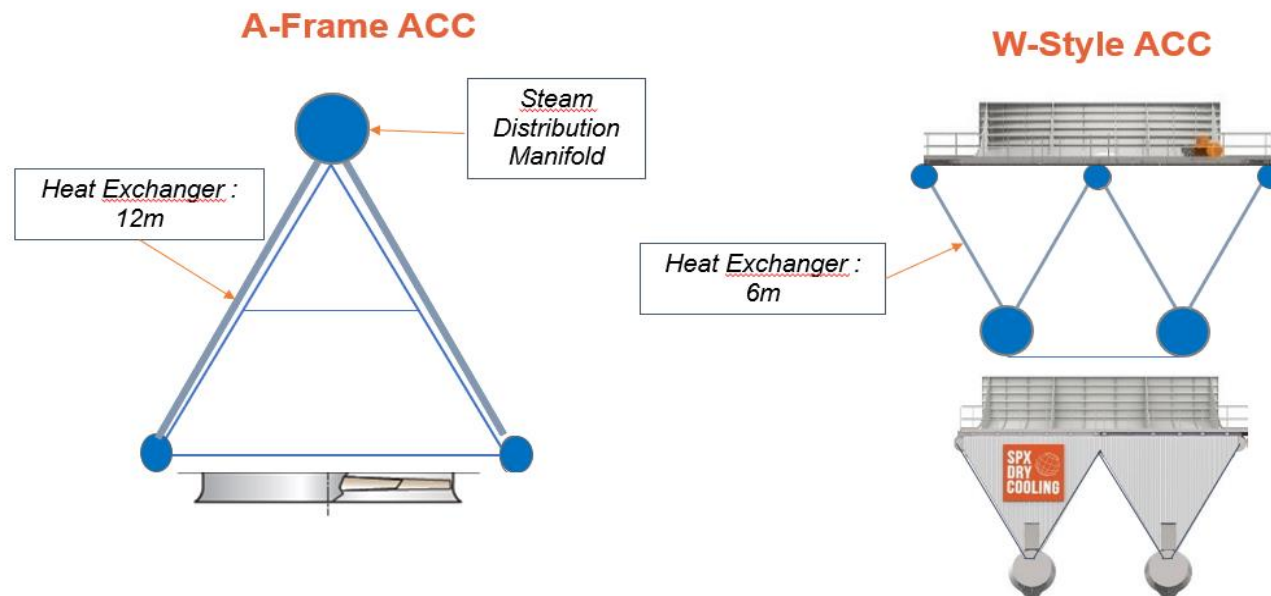
- Higher exit velocity
- Fans 'protected' by bundles

A-Frame



- Lower exit velocity (about 4-5 m/s).
- Extended Windwalls to mitigate recirculation (up to top of steam manifold)

Subcooling & Performance Under Low-Temperature Conditions



W-Style® has 2 times more tubes which are 2 times shorter

Reduced steam side velocity and pressure drop within the heat exchanger

- Reduced minimum back pressure at low ambient
- Increase steam turbine output at low ambient
- Reduced sub-cooling at low back pressure

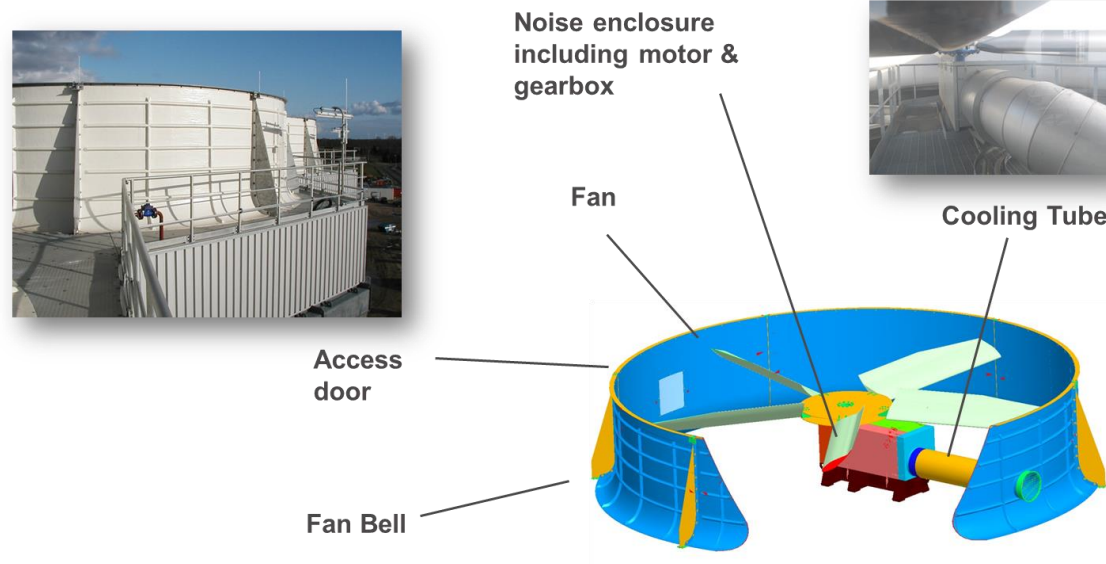
Subcooling & Performance Under Low-Temperature Conditions

W-Style ACC features a 2 x more Tubes with Shorter Tubes

- **Reduced steam velocity and pressure losses within the condenser**
- **Lower achievable turbine back pressure during cold-weather operation**
- **Higher steam turbine power output and improved overall plant efficiency at low ambient temperatures**
- **Reduced subcooling thanks to the steam and condensate flow through the same bottom manifold**



Noise Emission Levels



- Generated noise propagates more vertically. Noise reduction in site limits
- Motors & gearboxes could be inside noise enclosures
- Bundles act as a noise mitigation device (Air Inlet Noise is reduced)

W-Style – Conclusions

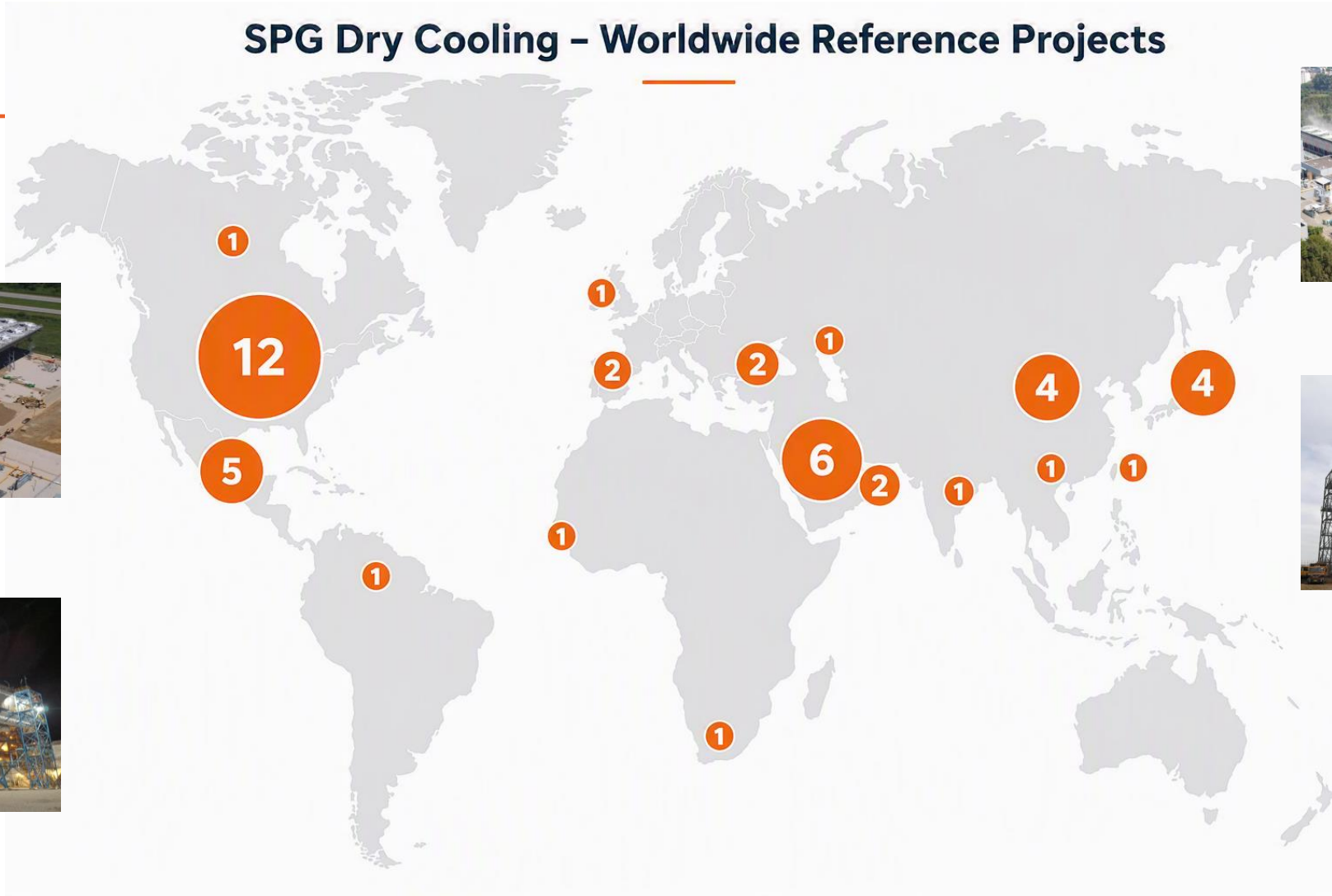
W-Style ACC® as Induced Draft Air Cooled Condenser

- ✓ **Reduced overall steel weight**
- ✓ **ACC easier to assemble and to erect**
- ✓ **Reduced wind sensitivity**
- ✓ **Lower Steam velocity inside tubes**
 - ✓ Reduced pressure losses => Lower ACC back pressure & subcooling
 - ✓ Enhanced annual average power plant output for the end user
- ✓ **Reduced visual impact**
 - ✓ Lower height / smaller ground footprint
 - ✓ Flexible foundation locations



W-Style – References

SPG Dry Cooling – Worldwide Reference Projects



Q&A



Thank you



TVA Cumberland