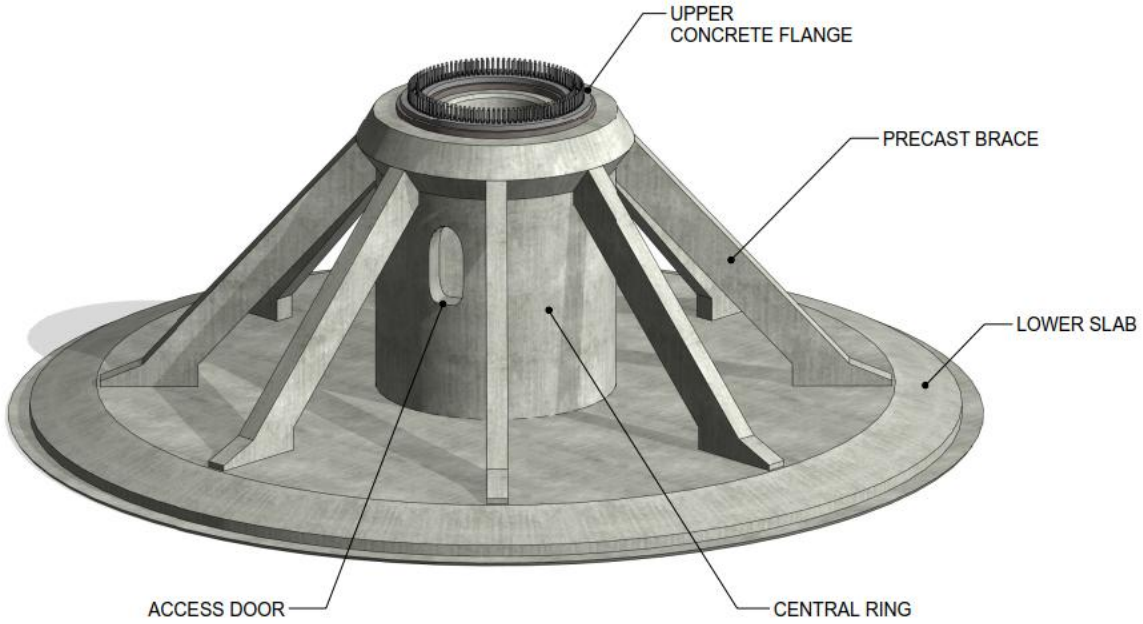
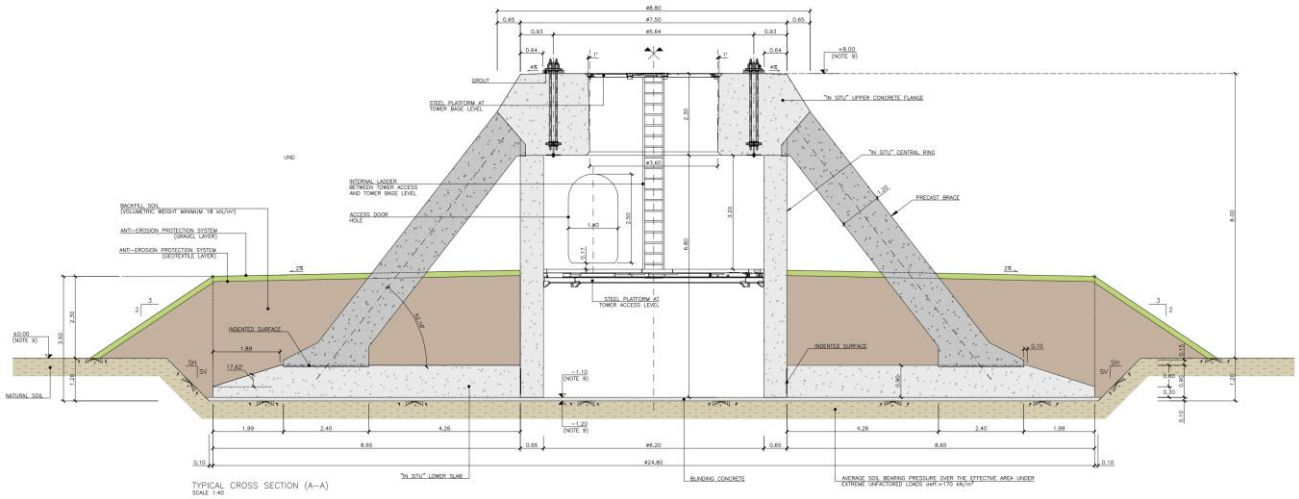
BRACED FOUNDATION

Bringing down the LCoE from the very base

BRACED FOUNDATION - CONCEPT DEFINITION





- **Central ring**: Cast on-site as an extension of the tower. Door is provided for an easy access, at the platform level.
- 8x on-site precast concrete **braces**.
- L**ower slab**: Cast on-site with a thickness <1m, instead 3-4m of conventional foundations.
- **Upper concrete flange** with embedded standard anchor cage: same number of bolts and layout but half of the conventional length.
- **Internal elements** at tower base (including elevator) can be located inside the foundation, at entrance level.

BRACED FOUNDATION - ADDED VALUE AND ADVANTAGES: Highlights (I)

⚡ Higher Energy Production

HH increase up to 10m, leading to 1 - 3% more energy production

Alternatively, if HH increase is not feasible, up to 10m reduction in tower height

💰 Lower LCoE

Energy production increase, leading to lower Levelized Cost of Energy (LCoE)

Lower LCoE allows the developer to bid more aggressively

NPV of the extra energy offsets the TOTAL foundation CAPEX.

Foundation system chosen to achieve the world's lowest ever tariff in a wind energy facility already built

15.7USD/MWh (Al Ghat Wind Farm, Kingdom of Saudi Arabia, 2025)

BRACED FOUNDATION - ADDED VALUE AND ADVANTAGES: Highlights (II)

Lower material usage

Concrete (and steel) savings when comparing to a conventional foundation without HH increase

40% concrete savings + 15% steel savings (CF no HH increase vs BF HH+4m increase)

20% concrete savings + 5% steel savings (CF no HH increase vs BF HH+8m increase)

The bigger the turbine and the higher the tower, the bigger the savings

CF Conventional Foundation

BF Braced Foundation

Lower CO_2 footprint

30-40% total CO_2 footprint reduction when compared to a conventional foundation

10-15% CO_2 footprint reduction concrete + steel (CF no HH increase – BF HH+8m increase)

20-25% CO_2 footprint additional reduction by shortening the steel tower

If accounting the extra electricity it produces compared to a CF solution, BF not only offsets the total carbon footprint of a CF but actually becomes a carbon sink—sequestering more carbon than an equivalent conventional foundation would emit during its construction

BRACED FOUNDATION - ADDED VALUE AND ADVANTAGES: Highlights (III)

Lower construction risk

Minimizes construction risks not directly economically quantifiable but providing a clear competitive advantage

Concrete volumes to be poured at once much reduced, minimizing risk of undesirable and dangerous cold joints

Maximum element thickness of approximately 85 cm (compared to 3.5 m in conventional designs), significantly reducing issues related to curing in large foundations

The installation of the anchor cage is not required until the final stages of foundation construction, so delays in its delivery do not constitute a bottleneck for the foundation construction schedule

All of the above with no relevant difference in the construction cost

BRACED FOUNDATION – HIGHER ENERGY PRODUCTION

Braced foundation AEP increase (MWh/WTG/yr)

6.6MW WTG

Hh_{final} = 128m (+8m)

$HH_{original}$ = 120m

$K_{Weibull}$=2.1

Air density = 1.18 Kg/m^3

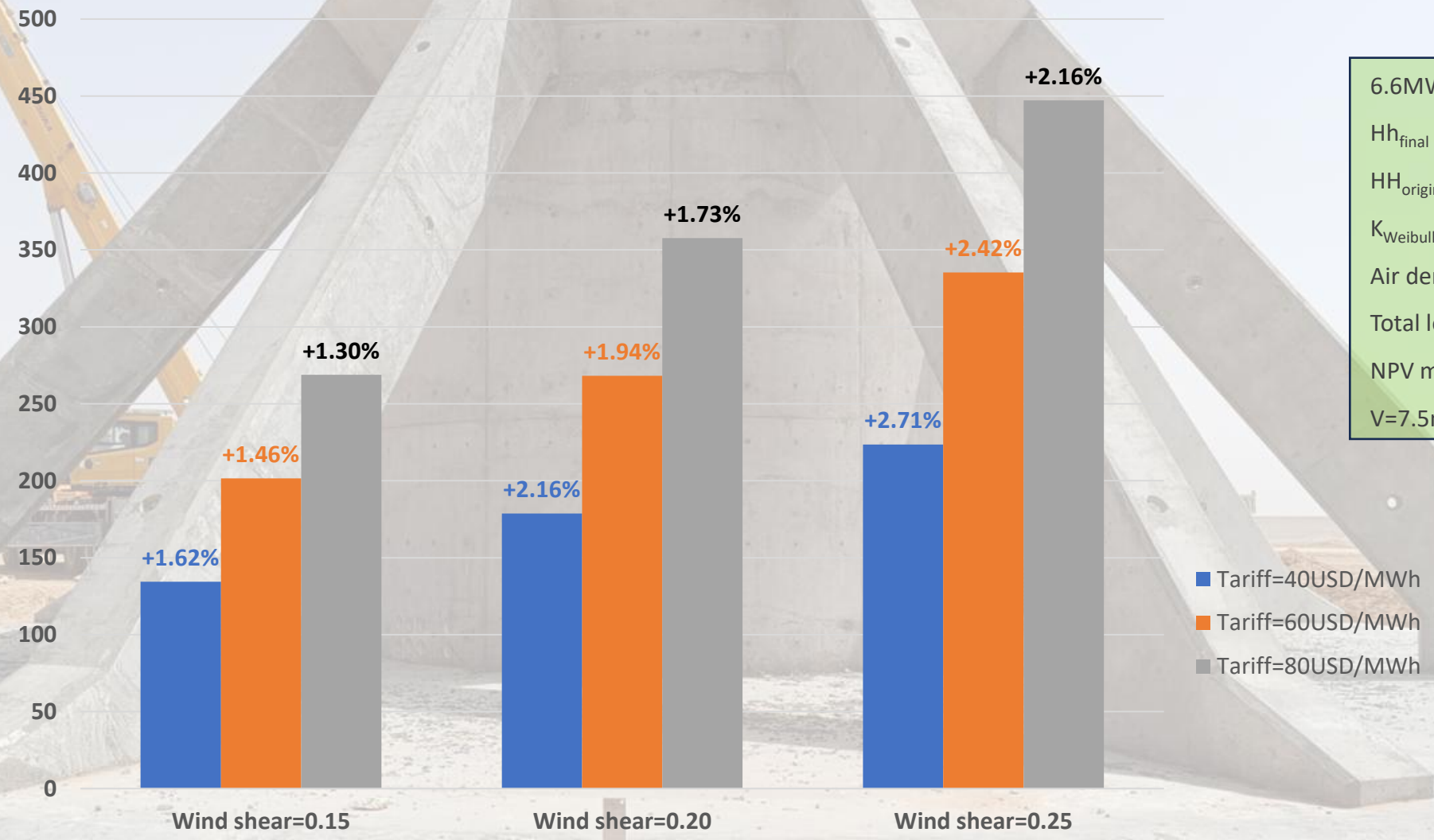
Total losses = 10%

Extra energy output enough to power 100 – 150 European households (4000kWh/household/yr)

Equivalent to turbine extra power boost of 0.13MW

BRACED FOUNDATION – LOWER LEVELIZED COST OF ENERGY (LCoE)

Braced foundation electricity revenue increase NPV ($kUSD/WTG/25yr)



6.6MW WTG

Hh_{final} = 128m (+8m)

$HH_{original}$ = 120m

$K_{Weibull}$=2.1

Air density = 1.18 Kg/m^3

Total losses = 10%

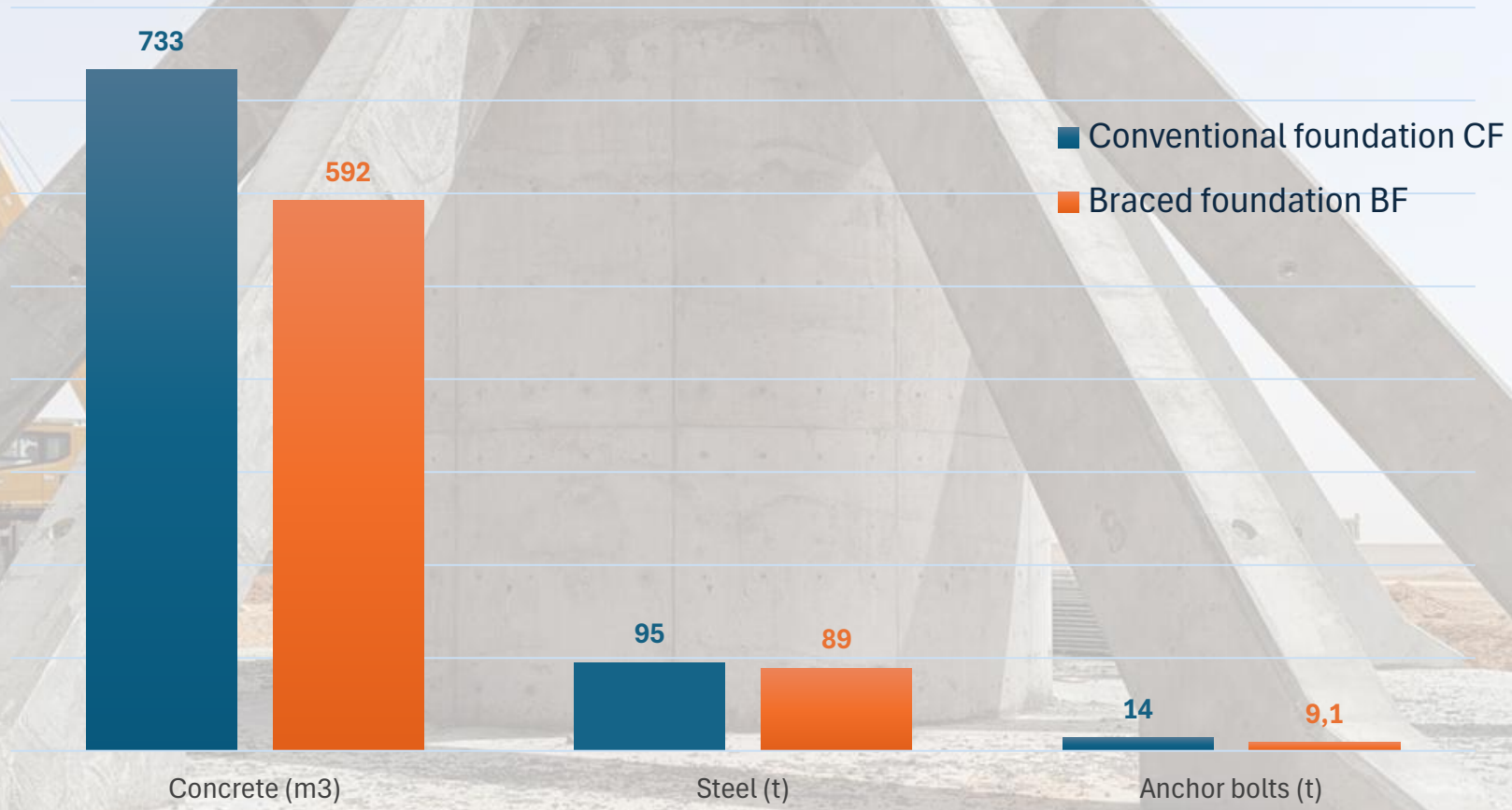
NPV multiplier coef. = 10

V=7.5m/s

Revenue increase ranging from $4MUSD to $13MUSD for a 200MW wind farm

BRACED FOUNDATION – LOWER MATERIAL USAGE

Braced foundation material savings: CF no HH increase vs BF HH+8m increase



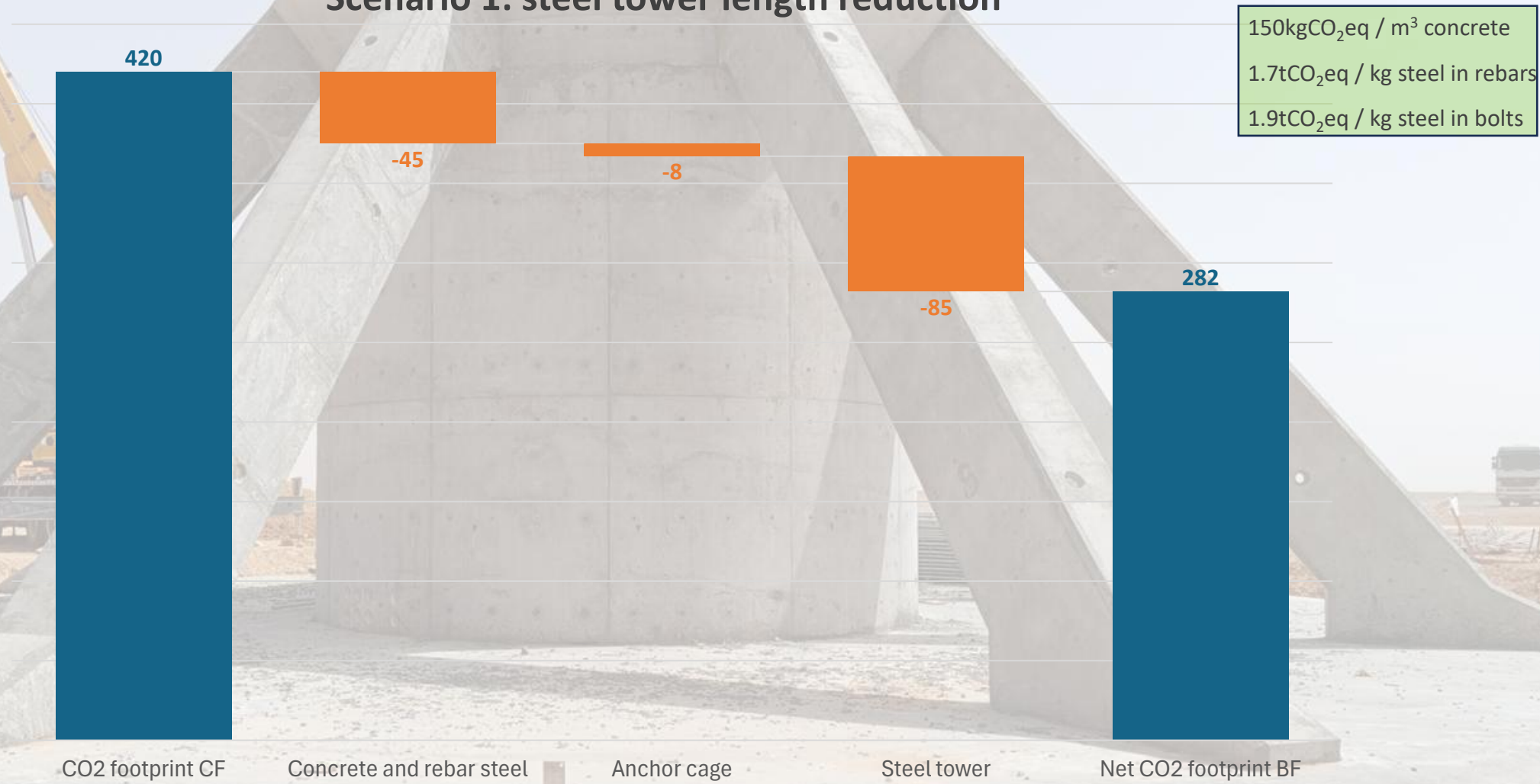
19% savings in concrete + 6% savings in reinforcing steel + 35% savings in anchor bolts length

PLUS: shortening 8m steel tower ~ 50t structural steel

BRACED FOUNDATION – LOWER CO_2 FOOTPRINT

Braced foundation CO_2 footprint reduction: CF no HH increase vs BF HH+8m increase (tCO_2eq)

Scenario 1: steel tower length reduction

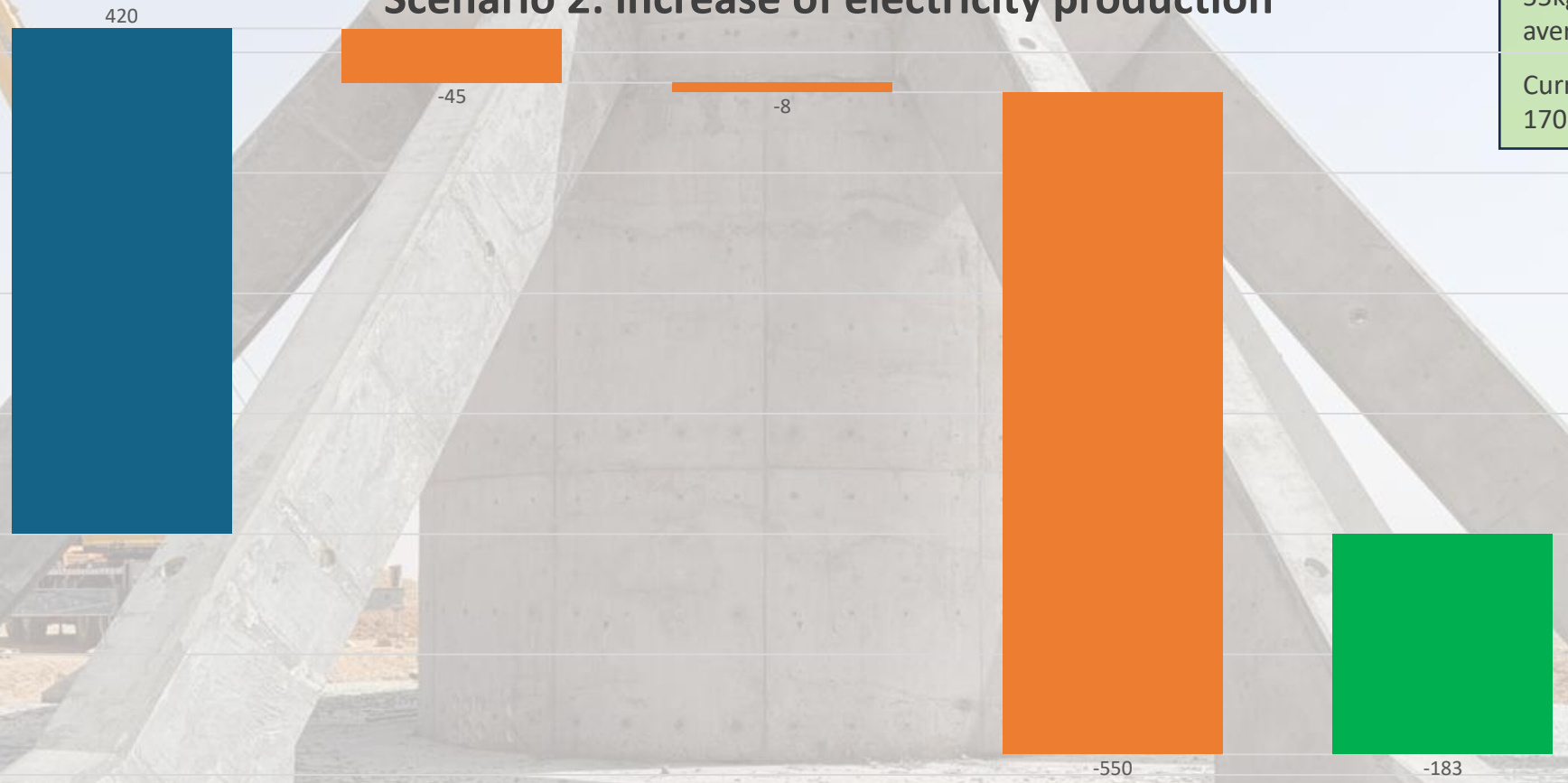


33% reduction of the overall foundation CO_2 footprint → 7-10% reduction of the total CO_2 footprint of the wind farm

BRACED FOUNDATION – LOWER CO_2 FOOTPRINT

Braced foundation CO_2 footprint reduction: CF no HH increase vs BF HH+8m increase (tCO_2eq)

Scenario 2: increase of electricity production



55kgCO_2eq / MWh, estimated as average for the 2025-2050 period

Current average UE (2024): 170kgCO_2eq / MWh

BF not only offsets all the CO2 footprint of a conventional foundation but becomes a carbon sink when considering the extra electricity output and its

BRACED FOUNDATION - TRACK RECORD AND EXPERIENCE

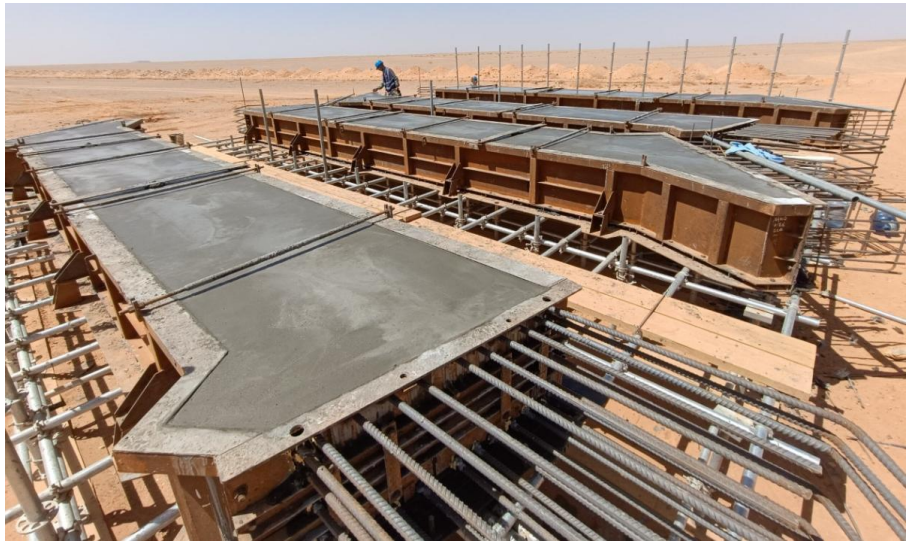
- **2.2 GW** installed, 500WTG under current operation
- **0.7GW** under construction as of March 2026, 87 WTG

- **8 countries and 4 different OEMs** (European and Chinese)

- **Certifications** succeeded with TÜV-SUD and DNV-GL.
- Technical and **commercial support** during study and deployment of the solution.
- **Site presence to provide technical support**, guaranteeing the technology fully aligned with the original design during the first implementation.

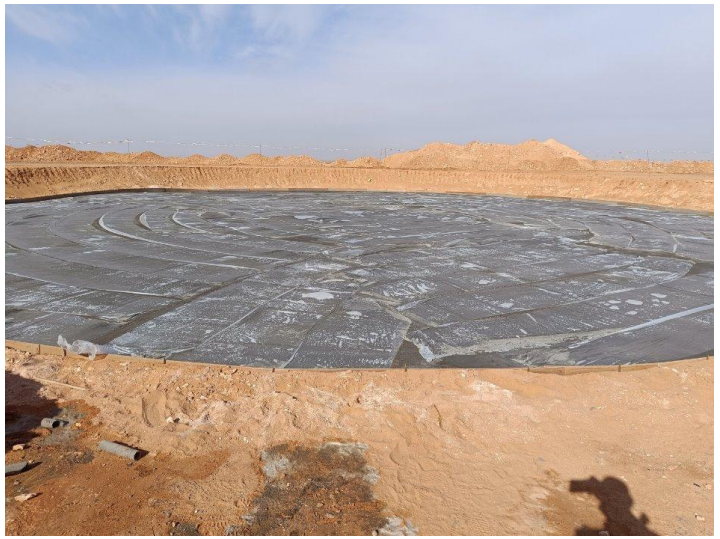
CLIENT	WIND FARM	COUNTRY	TURBINE	WTG	MW	YEAR
sepcoIII	YANBU	KINGDOM OF SAUDI ARABIA	WD200-7700IW-T102+8m	87	670	2025-2026 (under construction)
sepcoIII	AL GHAT	KINGDOM OF SAUDI ARABIA	WD200-7700IW-T123+8m	80	616	2024-2025
sepcoIII	WAD AL SHAMAL	KINGDOM OF SAUDI ARABIA	WD200-7700IW-T123+8m	67	516	2024-2025
GEL	CANUDOS I-II	BRAZIL	G132-3.55MW T84 + 6m	28	99	2020-2021
DOISA	VENTOS SERRA DO MEL III	BRAZIL	G132 IIA 3.3-3.465MW T114 +6m	44	153	2020
TSK	DUMAT AL JANDAL	KINGDOM OF SAUDI ARABIA	V150 4,2MW HH124+7m	99	400	2019
DOISA	VENTOS SERRA DO MEL	BRAZIL	G132 IIA 3.3-3.465MW T114+6m	47	163	2019
JINKE 金科	BEITASHAN	CHINA	CSIC H136- 2,2MW HH100+6m	45	99	2019
Vestas	BODENSEE	GERMANY	V136 HH 132+2m	1	3.5	2018
Vestas	BARKOW	GERMANY	V136 HH 132+2m	1	3.5	2018
Vestas	PEÑA VENTOSA	SPAIN	V90 3MW HH72+6m	4	12	2018
Gamesa	TIZIMIN	MEXICO	G114-2.1MW IIIA H125+4m	40	86	2017
aldesa	SAN JACINTO	MEXICO	G114 2MW T80 +4m CIIIA	10	20	2016
Gamesa	KAYATHAR	INDIA	G97 2MW T100+4m	3	6	2016
Gamesa	BANZI	ITALY	G97 2MW HH90 +1.35m IIA	15	30	2014

BRACED FOUNDATION - CONSTRUCTION PHASES



0. Precast of the braces in a simple, small facility within the wind farm

BRACED FOUNDATION - CONSTRUCTION PHASES



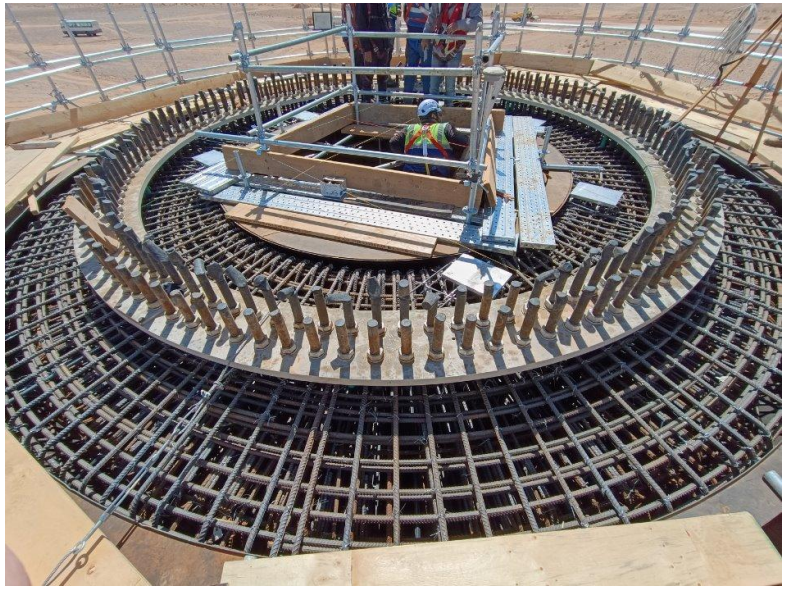


1. Excavation, binding concrete, central ring construction and braces positioning

BRACED FOUNDATION - CONSTRUCTION PHASES





2. Lower slab construction and anchor cage installation

BRACED FOUNDATION - CONSTRUCTION PHASES

3. Upper flange construction, soil filling and turbine installation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