



WellPower Technologies

"Powering Progress, Sharing Success" - Partner with us for a sustainable and profitable future in energy production.

WellPower Technologies AS
Org. nr: 930 888 532
www.WellPowerTechnologies.com
Contact:
Post@WellPowerTechnologies.com

Address:
Løvsethaugen 27
7224 Melhus
Norway

WEX²® – Wellstream Expansion and Waste Energy Extraction



Plateau Production Phase

Characterized by reservoir pressure that exceeds the requirements to sustain the process plant's designed production rate.

▪ **Wellstream Expansion - Power Generation**

Produces electrical power from the pressure reduction that occurs as the gas arrives at the platform

▪ **Waste Heat Extraction – Power Generation**

Excess heat from Waste Heat Energy Recovery Units is used to preheat the gas, maximizing power production through a combined cycle and to control downstream temperature wrt. HET

▪ **Isentropic Expansion Benefits – Production Optimization**

The isentropic expansion in the turboexpander cools the gas far more effectively than conventional technology, enabling multiple optimization opportunities

- Enhanced condensate recovery
- Potential to increase plant pressure, reducing compression energy
- Lower demand for seawater, which can be used elsewhere for energy optimization
- Enables significantly greater waste heat extraction
- Less frictional losses in the process plant
- Plant pressure can be economically reduced due to increased power generation, oil/condensate production and colder gas which enables more waste heat extraction

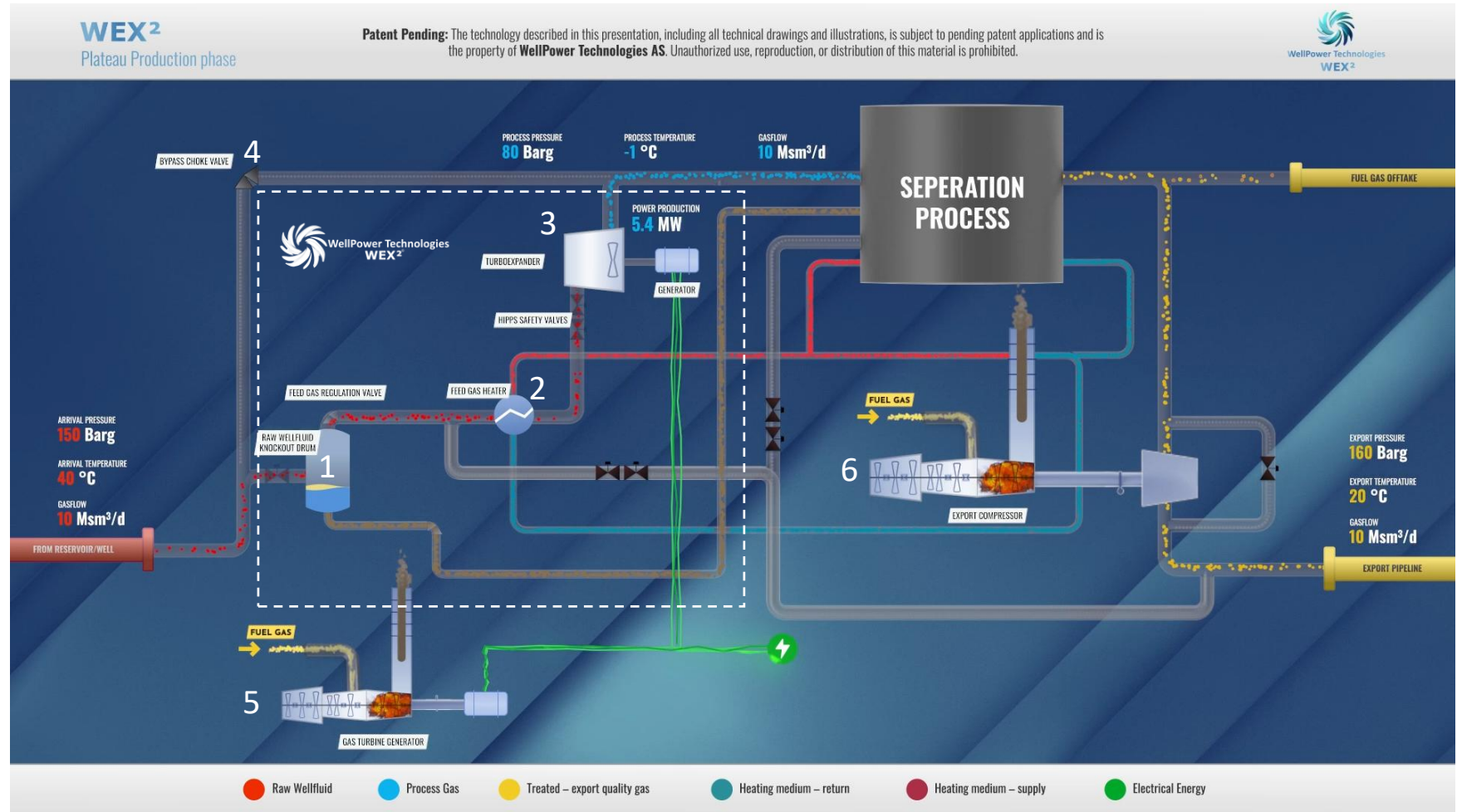
The listed advantages significantly enhance the plant's flexibility, enabling real-time optimization of production to align with commodity pricing fluctuations

Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of **WellPower Technologies AS**. Unauthorized use, reproduction, or distribution of this material is prohibited.

WEX²® – Wellstream Expansion and Waste Energy Extraction Technology presentation



WellPower Technologies
WEX²®



Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of **WellPower Technologies AS**. Unauthorized use, reproduction, or distribution of this material is prohibited.

WEX²® – Wellstream Expansion and Waste Energy Extraction



Decline Production Phase

Characterized by insufficient reservoir pressure to sustain the process plant's designed production rate.

- **Expansion of Waste Recycle flows - Power Generation**

Generates electrical power through pressure reduction when recycling flows are reintroduced into the process plant, typically occurring when compressors operate below their minimum design rate.

- **Waste Heat Extraction – Power Generation**

Excess heat from Waste Heat Energy Recovery Units is used to preheat the gas, maximizing power production through a combined cycle and to control downstream temperature.

- **Isentropic Expansion Benefits – Production Optimization**

The isentropic expansion in the turboexpander cools the gas far more effectively than conventional technology, enabling multiple optimization opportunities.

This effect is particularly critical during the decline phase, where the large pressure differential allows the cold recycle gas to efficiently cool the wellstream.

- **Reduce OPEX – extend economic field life-time and Recovery factor**

WEX²® unlocks a significant reduction in OPEX and CO₂ emissions , which will extend field lifetime and increased field recovery factor

Note: During the decline phase, new tie-in fields can be connected to WEX²® to establish a new plateau phase while simultaneously expanding waste recycle flows.

Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of **WellPower Technologies AS**. Unauthorized use, reproduction, or distribution of this material is prohibited.

WEX²® – Wellstream Expansion and Waste Energy Extraction Technology presentation

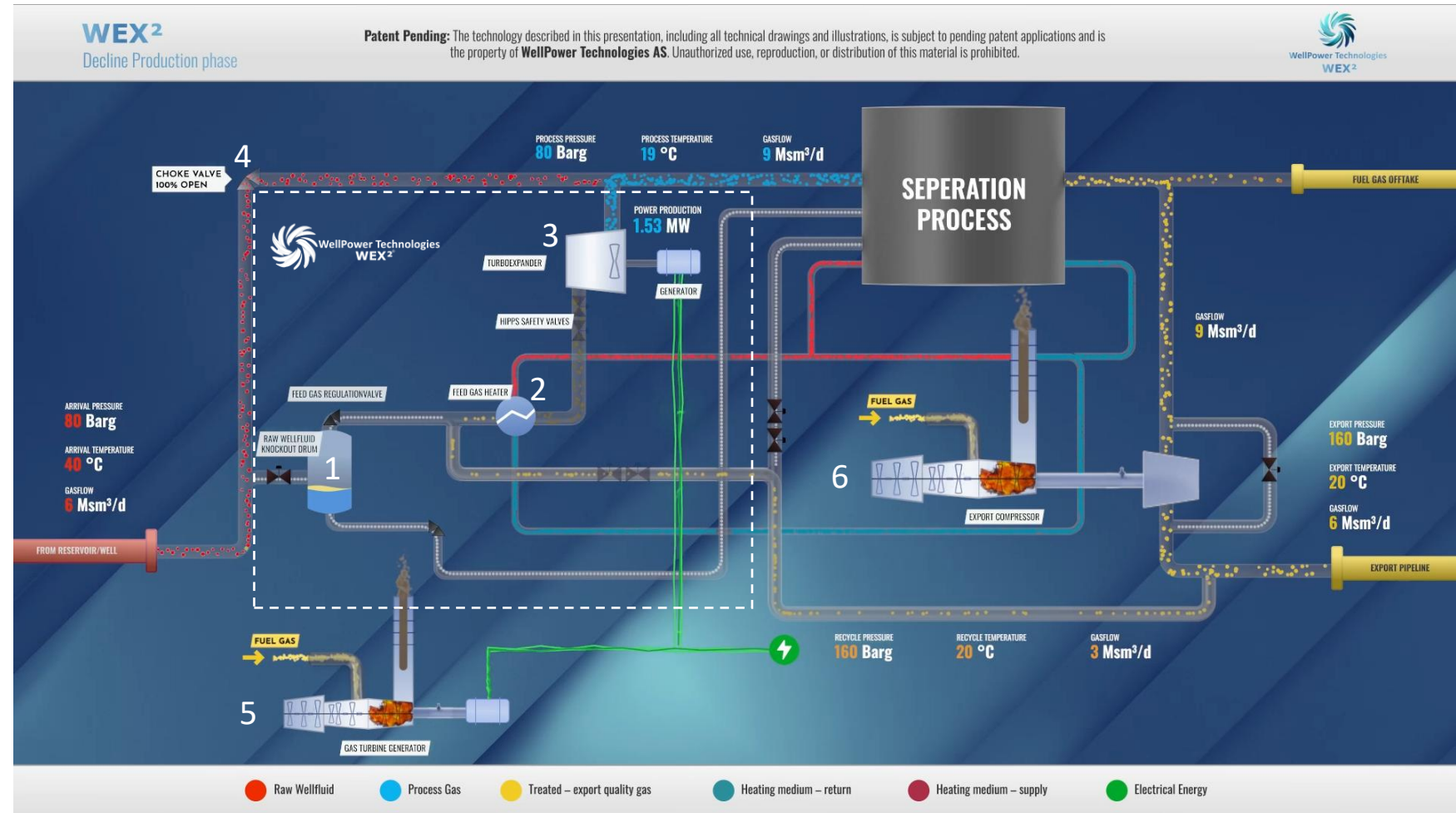


WellPower Technologies

WEX²®

Decline phase

- 1: Raw Wellfluid knockout drum
- 2: Feedgas heater
- 3: Turboexpander – Generator
- 4: Bypass choke (original choke for brownfield retrofit)
- 5: Gas turbine – Generator
- 6: Gas Turbine - Export Gas Compressor



Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of **WellPower Technologies AS**. Unauthorized use, reproduction, or distribution of this material is prohibited.

WEX²® – Wellstream Expansion and Waste Energy Extraction Technology presentation

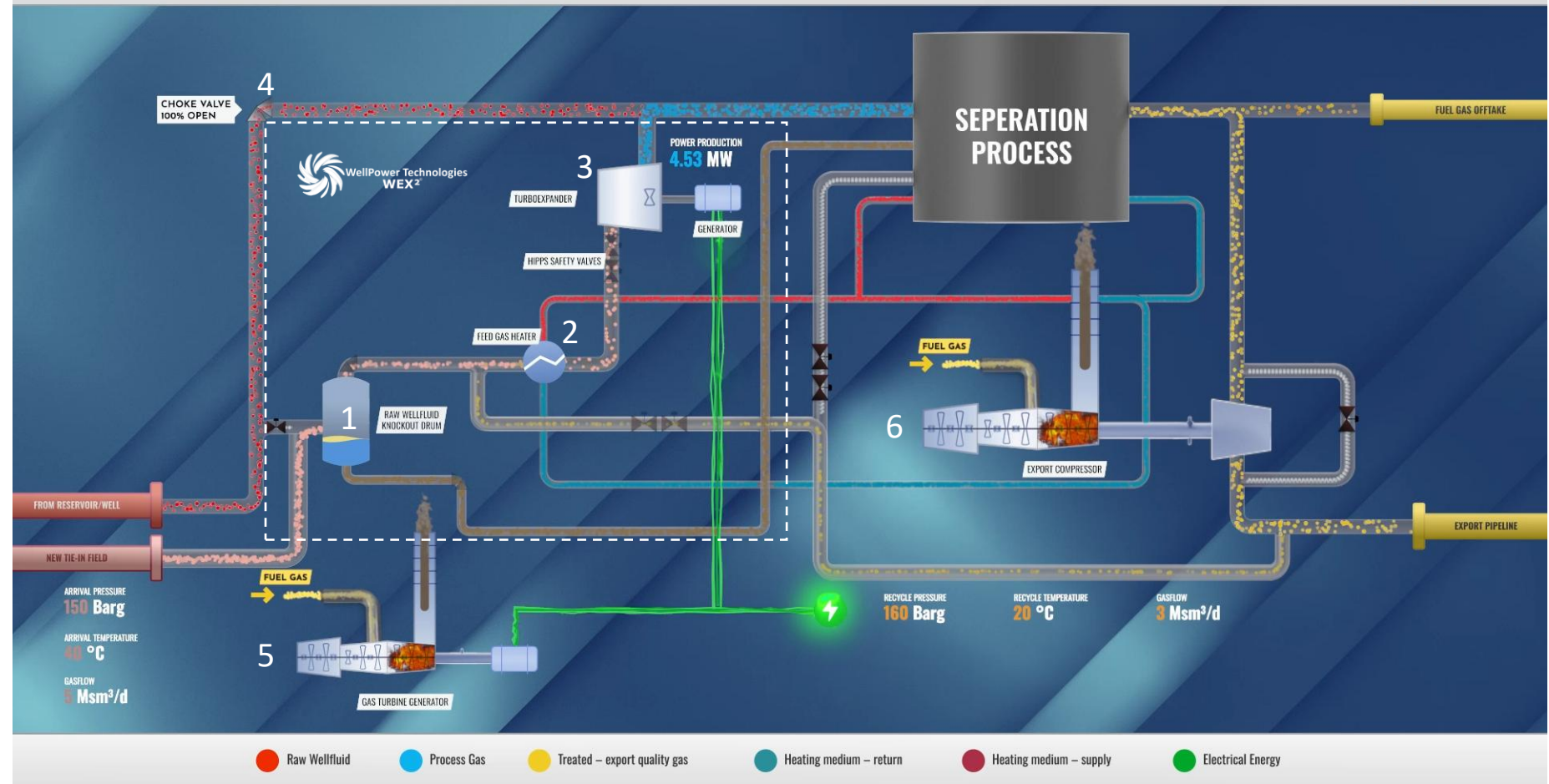


WellPower Technologies
WEX²®

WEX²

Decline Production phase - New field Tie-In

Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of WellPower Technologies AS. Unauthorized use, reproduction, or distribution of this material is prohibited.



- New tie-in field
- 1:Raw Wellfluid knockout drum
 - 2:Feedgas heater
 - 3:Turboexpander – Generator
 - 4:Bypass choke(original choke for brownfield retrofit)
 - 5:Gas turbine – Generator
 - 6:Gas Turbine - Export Gas Compressor

Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of WellPower Technologies AS. Unauthorized use, reproduction, or distribution of this material is prohibited.

WEX²® – Wellstream Expansion and Waste Energy Extraction



WellPower Technologies
WEX²®

Innovative Green Technology- Driving Profitable, Low-Carbon Natural Gas Production

▪ Economical drivers

- **Cuts CO2 Emission** Our technology drastically reduces your operational carbon footprint
- **Reduces fuelgas consumption** Which can be sold to market rather than combusted onboard
- **Offers an efficient way of part-electrification of the platform** without negative environmental impact and regulatory hurdle
- **Adapt & Profit with a competitive edge** Real-time flexibility to optimize operations based on commodity prices
- **Bridging technology** to enable full field electrification in combination with other renewable technologies

Profitable Delivers strong returns, **even without CO2 Quota savings**

▪ Our technology increases the plants redundancy, versatility and flexibility

- **Bridging technology** for other renewable technologies to enable full electrification of platforms
- Possibility for **Increased** condensate/oil production and other adaption based on commodity pricing
- Possibility to **direct export** of sales quality gas
- Export of power, if connected to grid
- Redundant power production - load sharing between export and generator gas turbines – more fuel efficiency

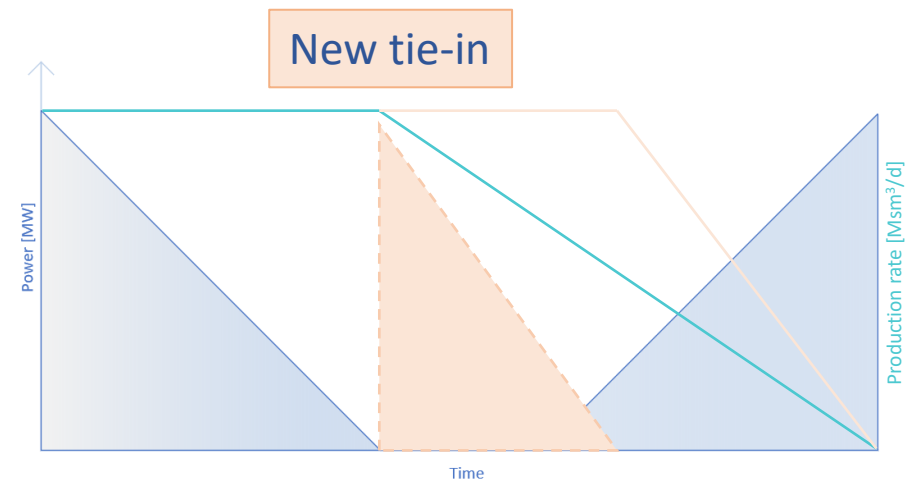
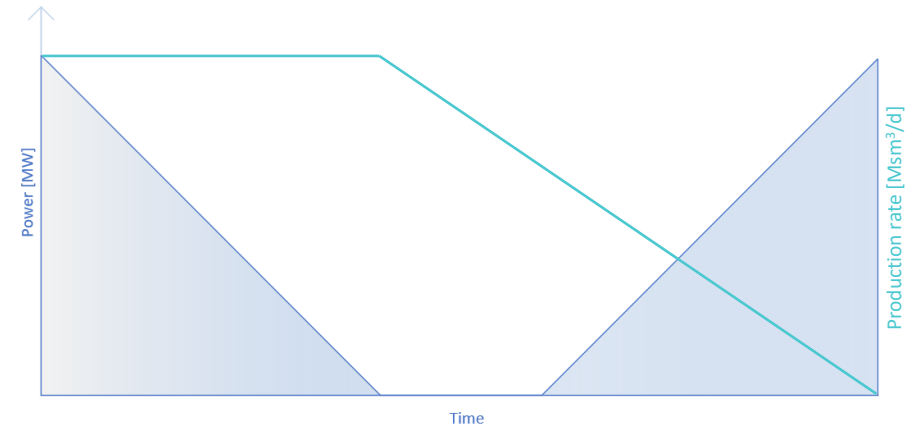
▪ Power output will form a bowtie shape

- Highest power output in the beginning of plateau production phase,
- and then increasing power output in late field life – **prolonging economic field lifetime and field recovery factor**

▪ Industry Proven components

- **No new components**, all components is widely known and tested in industry
- **Low technical complexity – TRL 6**
- Turboexpander has typical reliability of 99,8% - 99,95% ¹
- Turboexpander is a highly efficient machine with typically 85% mechanical efficiency

¹ Source: Bloch, Heinz, and Claire Soares. 2001. Turboexpanders and Process Applications. Boston: Gulf Professional Publishing.



Patent Pending: The technology described in this presentation, including all technical drawings and illustrations, is subject to pending patent applications and is the property of **WellPower Technologies AS**. Unauthorized use, reproduction, or distribution of this material is prohibited.

A medium case study

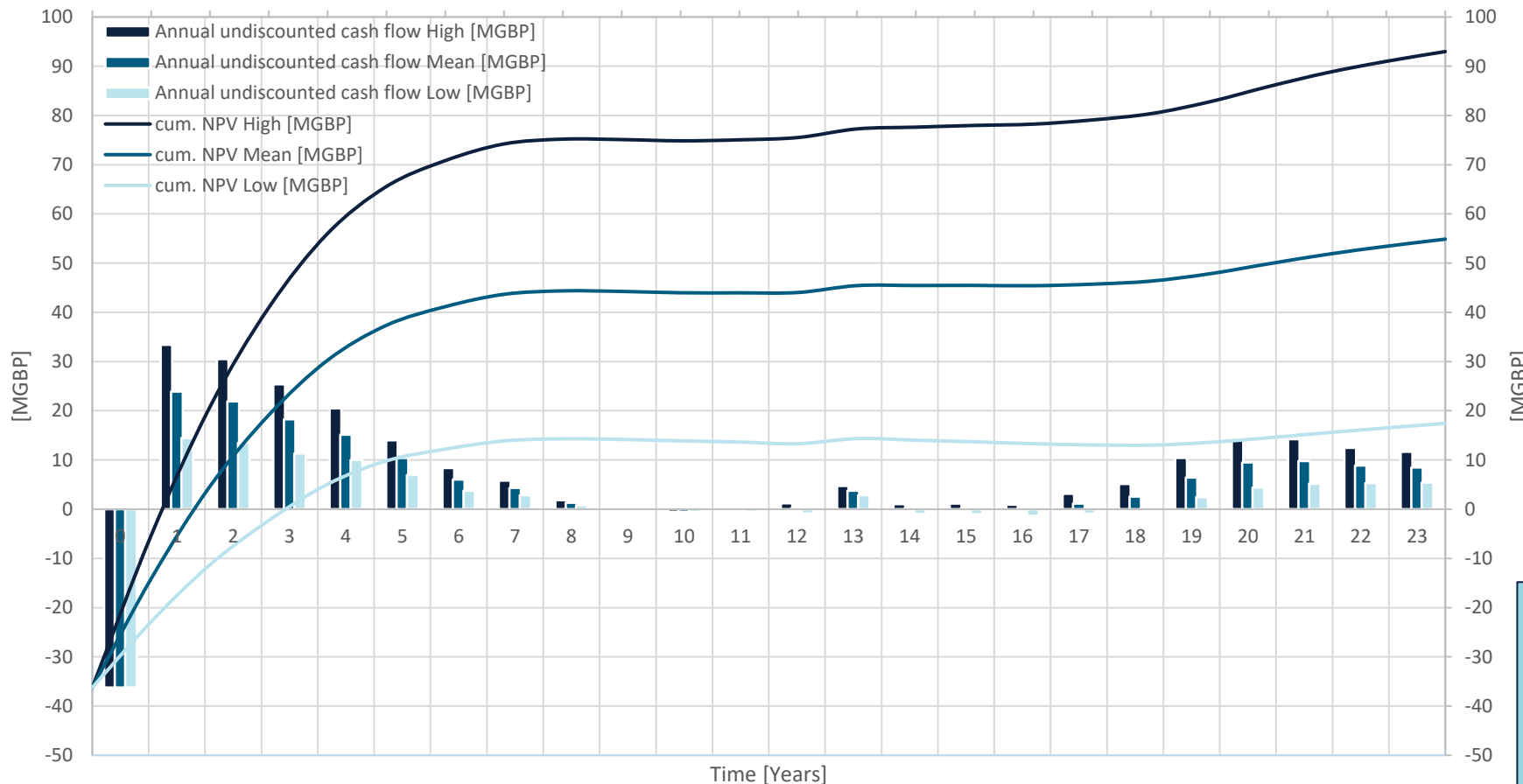
23-year gas field life cycle – a plant with WEX²® technology compared to a conventional plant
8-year plateau duration with 568 690 MMBTU/d production



WellPower Technologies

WEX²®

Medium case - Greenfield - NPV break even time, 8% discount rate



	Oil [USD/bbl]	Gas [pence/Therm]	CO ₂ Quota [£/mT]	Abatement cost [£/mTCO ₂ e]	NPV [MGBP]
High	119	159	70	-384	93
Mean	74	107	50	-212	55
Low	30	53	31	-43	17

Negative CO₂ abatement cost means **Profitable** even without CO₂ quota savings

CO ₂ emission reduction	[kmT CO ₂ e]	222
Reduced plant power consumption	[MWh]	35 830
Reduced fuelgas consumption	[MMBTU]	3 715 445
Increased condensate production	[MMBBL]	1,94
Acc. Turboexpander power production	[GWh]	743

- In this study the emphasis was on increasing liquids production, NOT power production / CO₂ emissions reduction
- GTG offline 43% of the production period
- No re-bundling of export compressor necessary
- 74,5 GWh surplus energy – not considered in NPV
- Extended field lifetime /increased RF - not considered in NPV
- **For electrified or partly electrified platforms** – assuming the WEX²® CAPEX is justified solely by the value of future generated electrical energy and no other advantages accounted for:
Net power cost **4,87 p/kWh** (undiscounted) /
9,18 p/kWh (8% disc. Rate)

A marginal case study

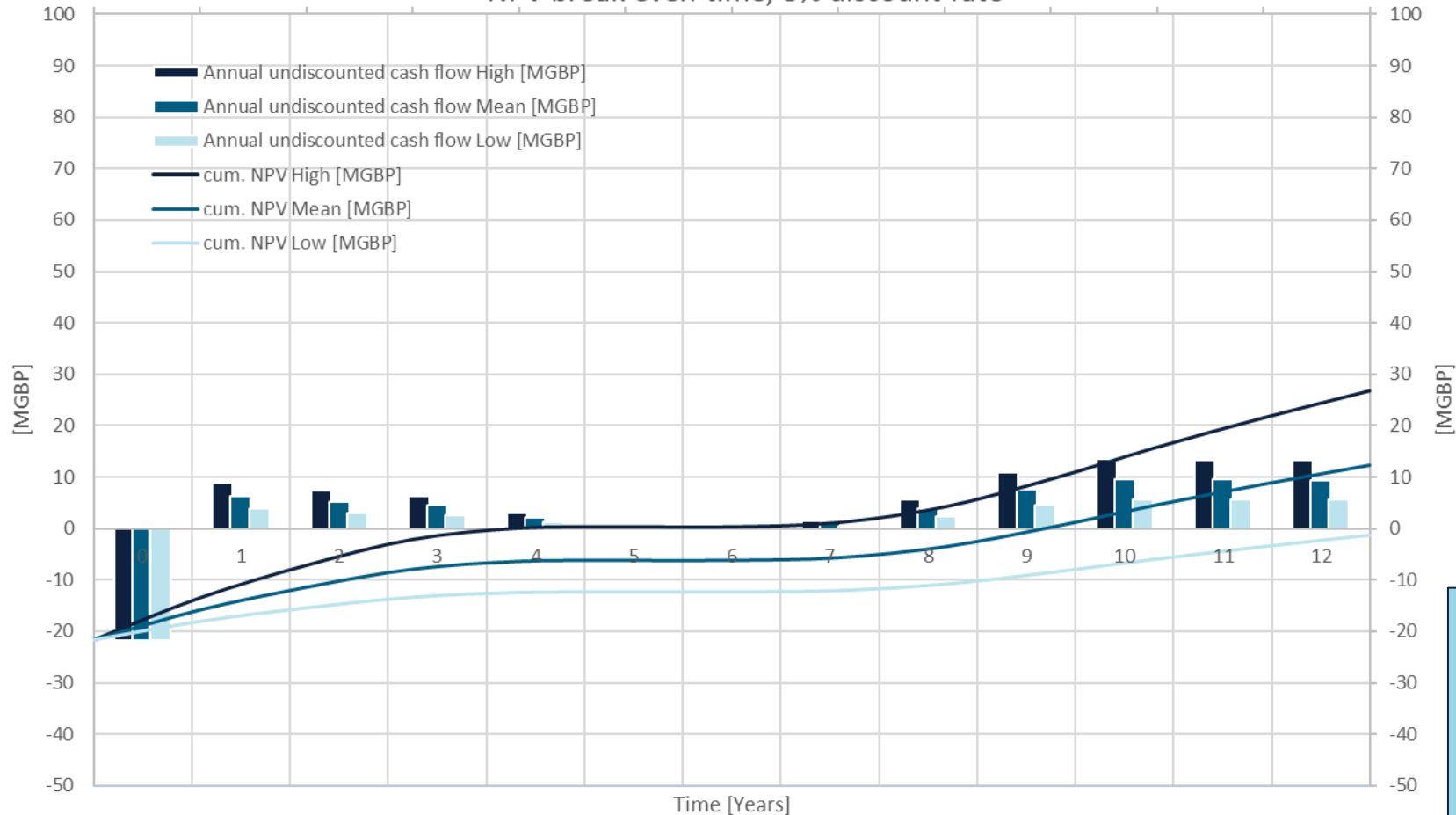
12-year gas field life cycle – an asset in decline production, with a 117 MMboe satellite tie in field - with WEX²® technology compared to a conventional plant



WellPower Technologies

WEX²®

NPV break even time, 8% discount rate



	Oil	Gas	CO ₂ Quota	Abatement cost	NPV
	[USD/bbl]	[pence/Therm]	[£/mT]	[£/mTCO ₂ e]	[MGBP]
High	119	159	70	-72	26,7
Mean	74	107	50	-18	12,4
Low	30	53	31	35	-1,3

Negative CO₂ abatement cost means **Profitable** even without CO₂ quota savings

CO ₂ emission reduction	[kmT CO ₂ e]	262
Reduced fuelgas consumption	[MMBTU]	4 549 524
Increased condensate production	[BBL]	7460
Acc. Turboexpander power production	[GWh]	560

- GTG offline **46%** of remaining field lifetime
- Total CO₂ emission reduction of **13%**
- [CO₂e/bbl] reduced by **18%**
- Increased gas export by **0,4%** over remaining field lifetime
- Overproduction of **64,5 GWh** – not considered in NPV
- Extended field lifetime /increased RF - not considered in NPV
- **For electrified or partly electrified platforms** – assuming the WEX²® CAPEX is justified solely by the value of future generated electrical energy and no other advantages accounted for:
 - Net power cost **4,11 p/kWh** (undiscounted) /
 - 6,98 p/kWh** (8% disc. Rate)

Organization

Concept/Feasibility study

- Only process engineers / operation managers with operator experience from control room and operations
- UniSim Process Simulations & LedaFlow/OLGA/K-spice dynamic multiphase flow simulations
- Process reports
- Package Engineering Pre-FEED

FEED / Detail Engineering

- Process Lead engineers with operational and Project engineering/commissioning and Operations experience
- **Discipline engineers:**
 - Mechanical/Piping/Layout
 - Material
 - Electro
 - Instrument/Telecom
 - SAS
 - Process

Operations support – Production and energy efficiency optimization

- Process engineers / operation managers with operator experience from control room and operations
- Lead Efficiency and Production Optimization Group sessions with operator to achieve maximum utilization of the WEX²® technology

Engineering services

- Production and Energy optimization
- Decommissioning project strategy
- Project Assurance
- Turnaround strategy





WellPower Technologies
WEX²

"Powering Progress, Sharing Success" - Partner with us for a sustainable and profitable future in energy production.

WellPower Technologies AS
Org. nr: 930 888 532
www.WellPowerTechnologies.com
Contact:
Post@WellPowerTechnologies.com

Address:
Løvsethaugen 27
7224 Melhus
Norway