

Commentaires sur les perspectives énergétiques

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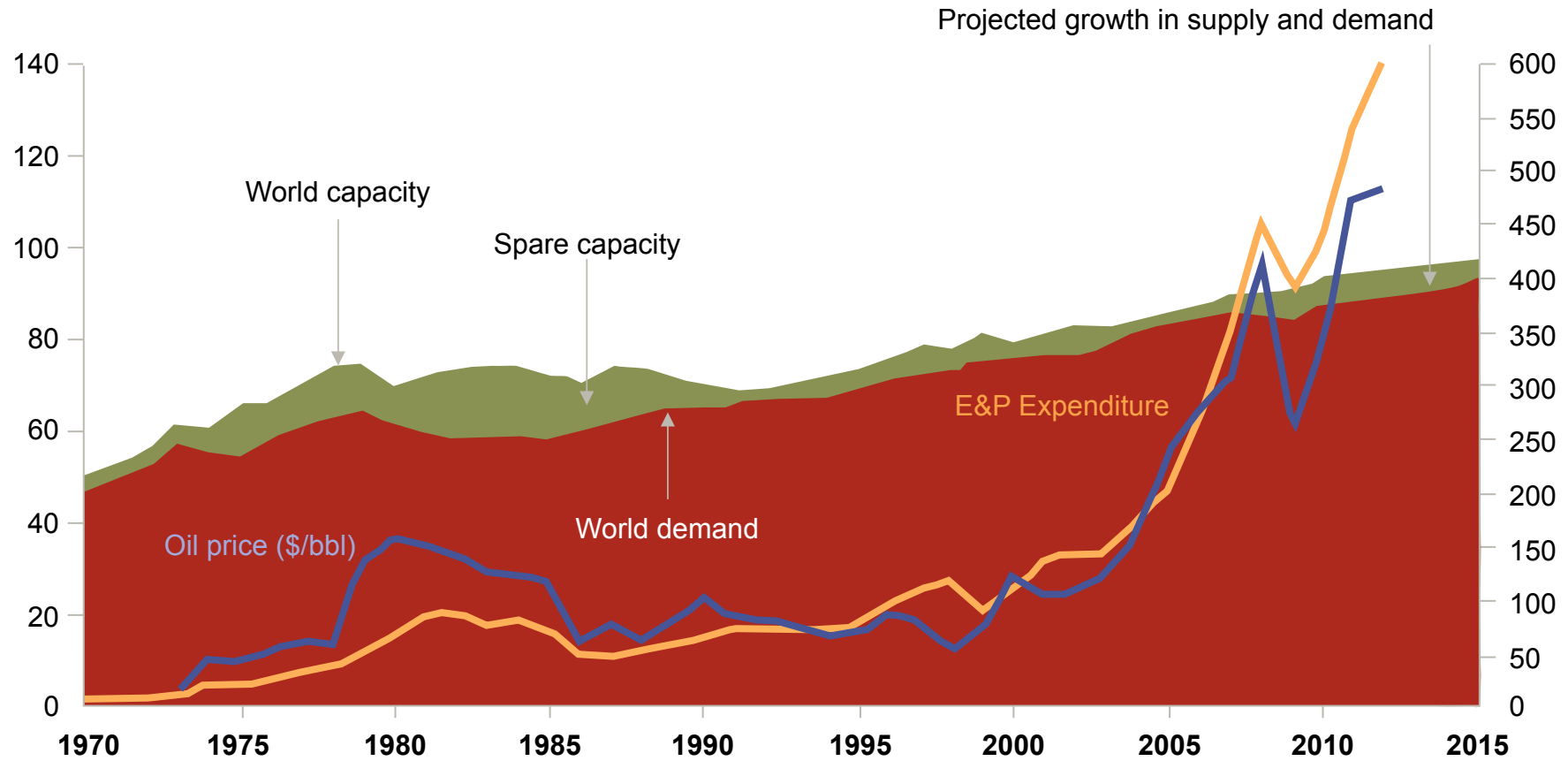
Macondo



Fukushima Dai Ichi

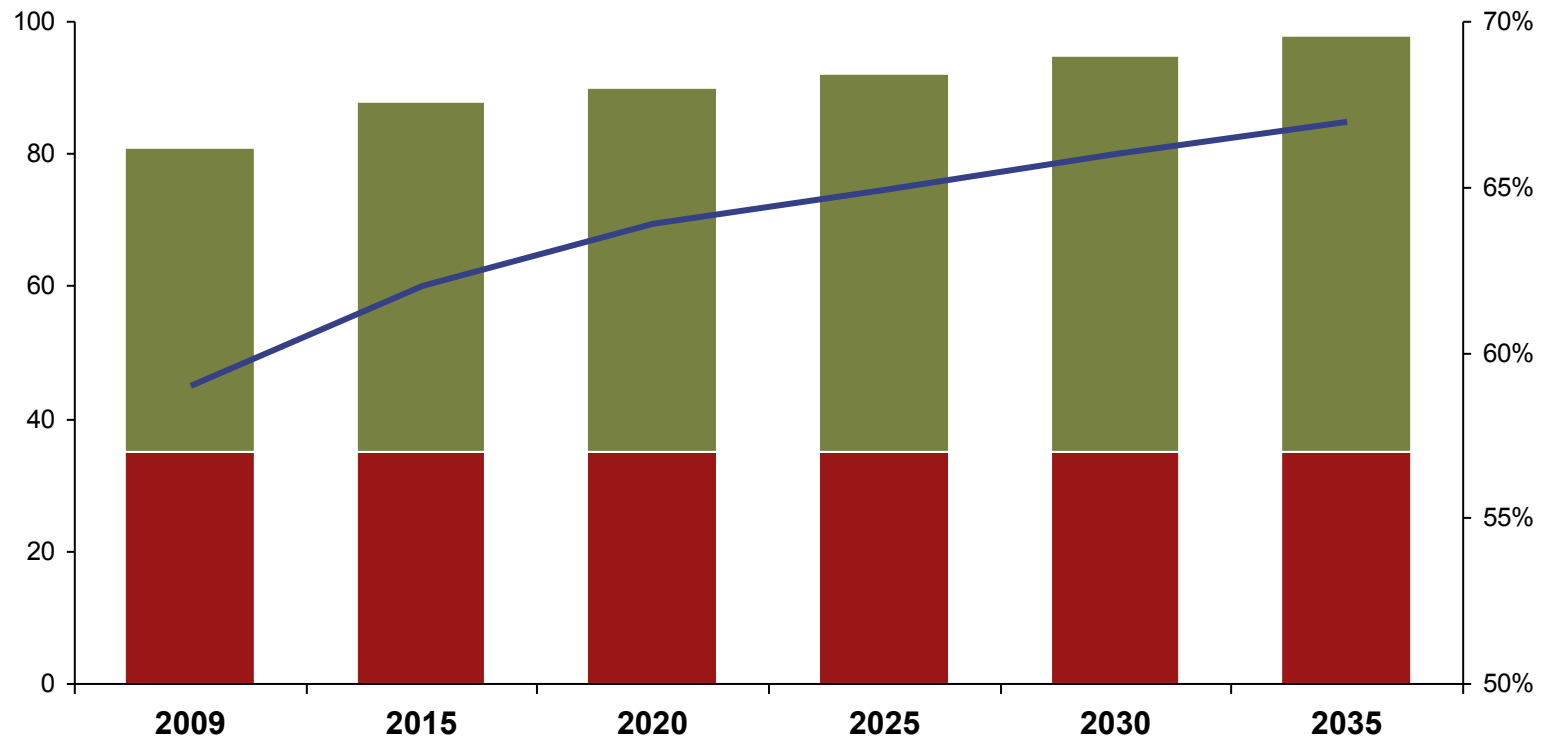


Oil supply and demand – A macro view



National oil companies in the ascendancy

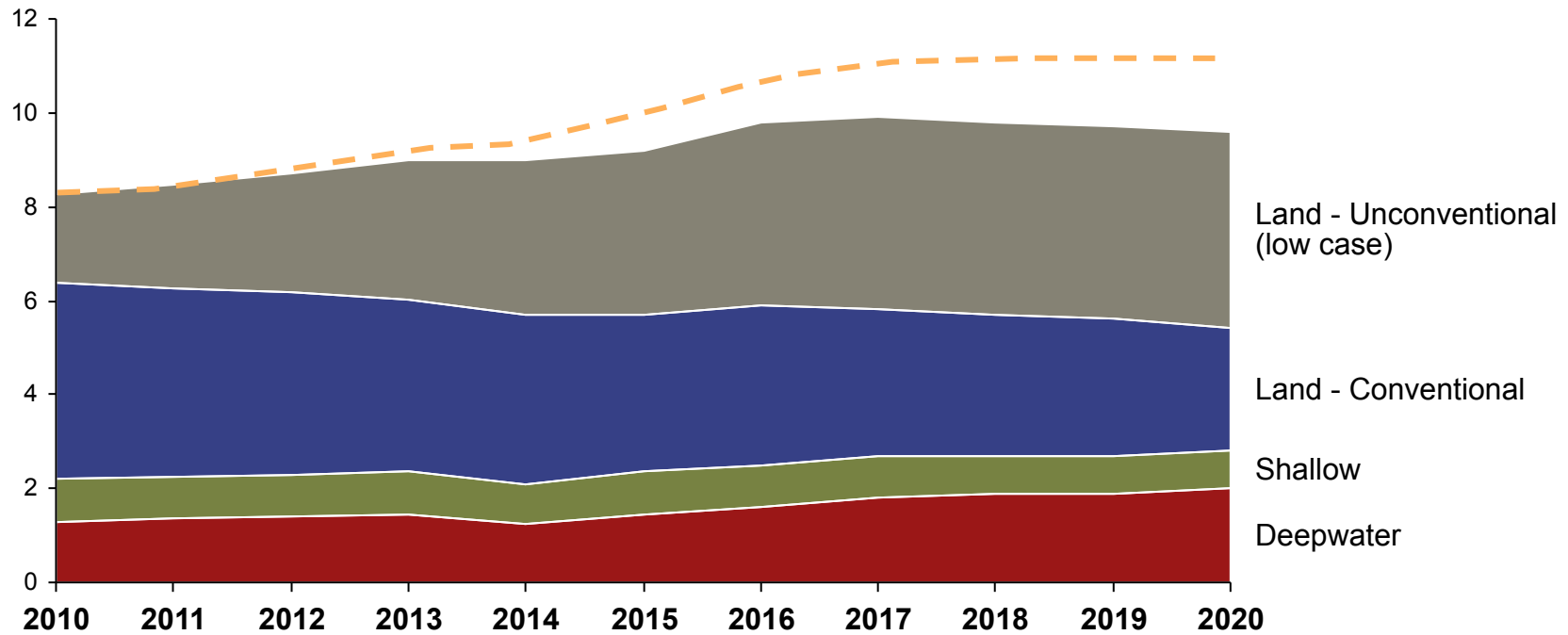
World oil equity production by company type in the New Policies portfolio (mbid, %)



■ NOCs ■ Others — Share of NOCs (%)

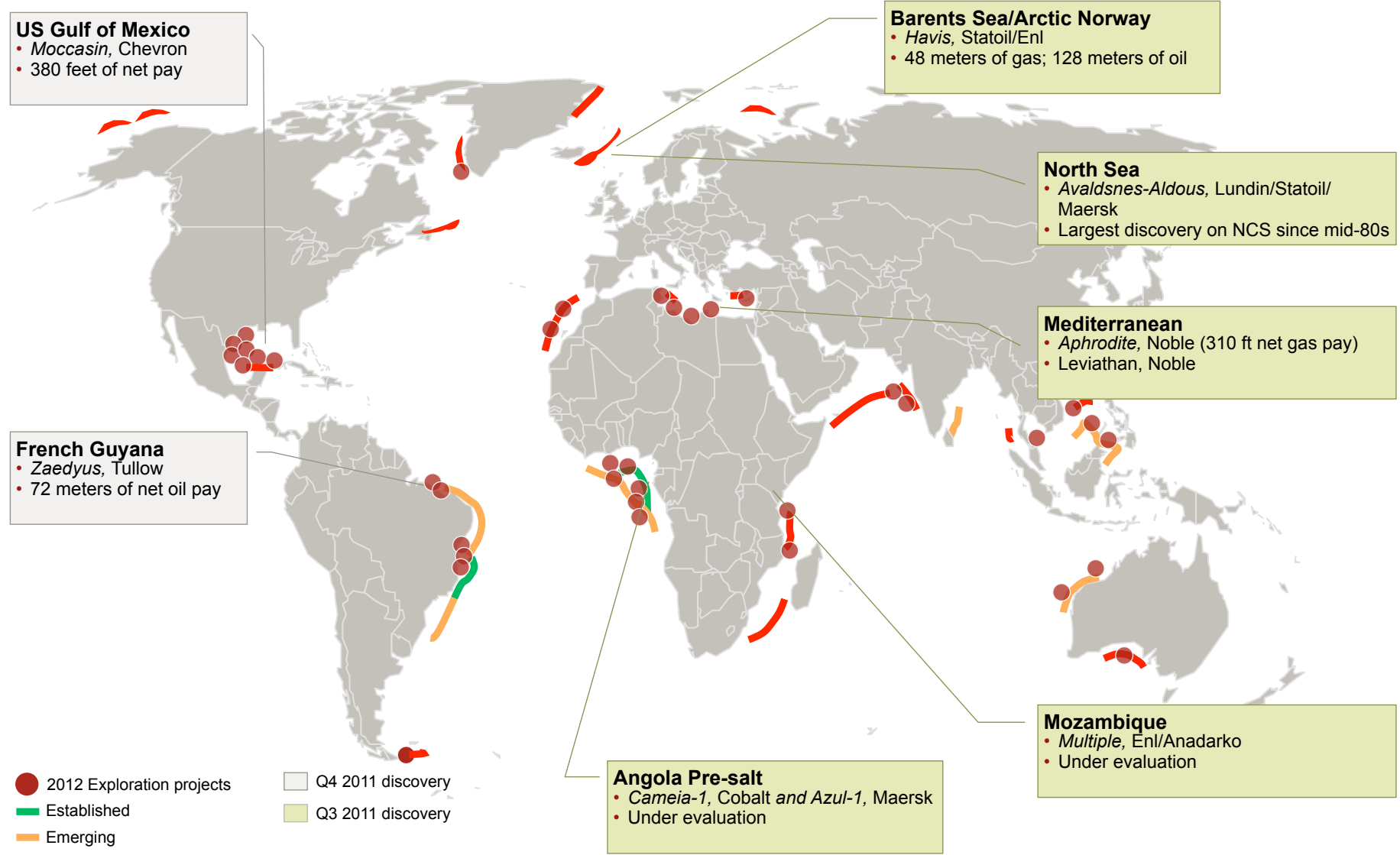
Role of unconventional oil expected to expand rapidly

North American crude production by asset type
(in million barrels per day)

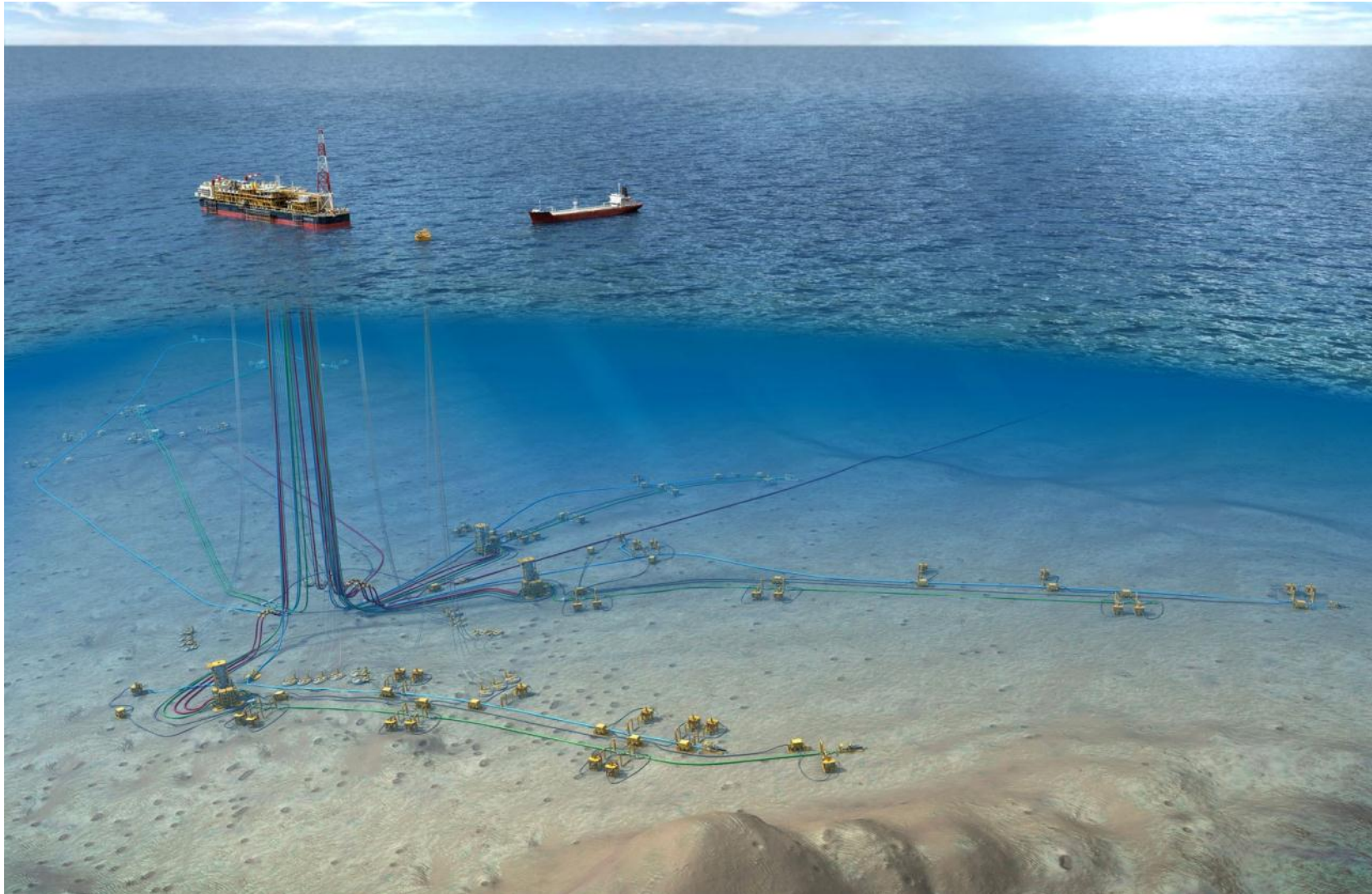


45% to 50% of North American liquids production expected to come from unconventional assets by the end of the decade

Recent discoveries and frontier exploration



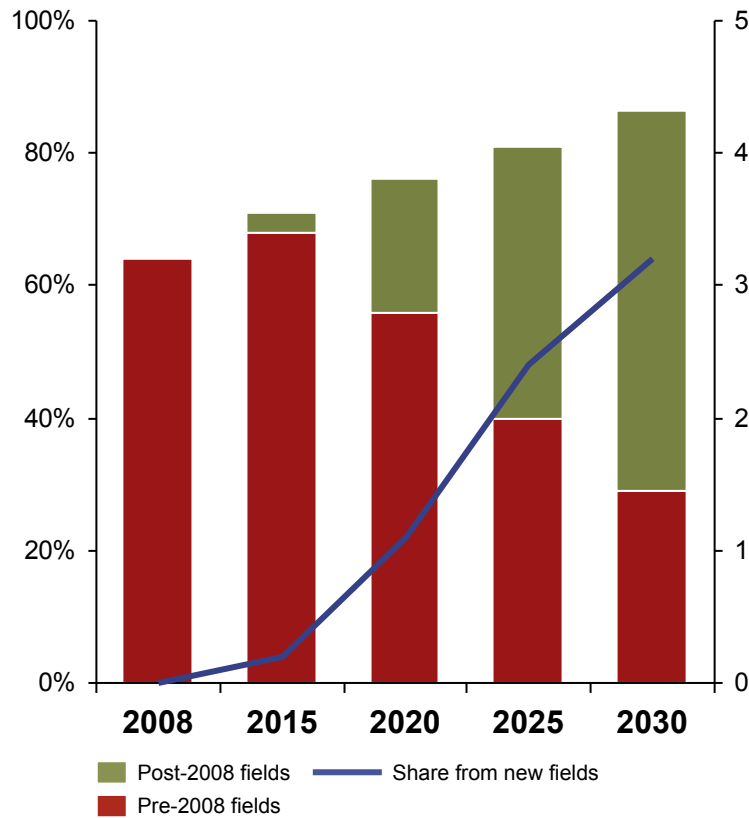
Architecture sous-marine : schéma du champ Pazflor- Angola



Long-term gas supply – Conventional versus unconventional

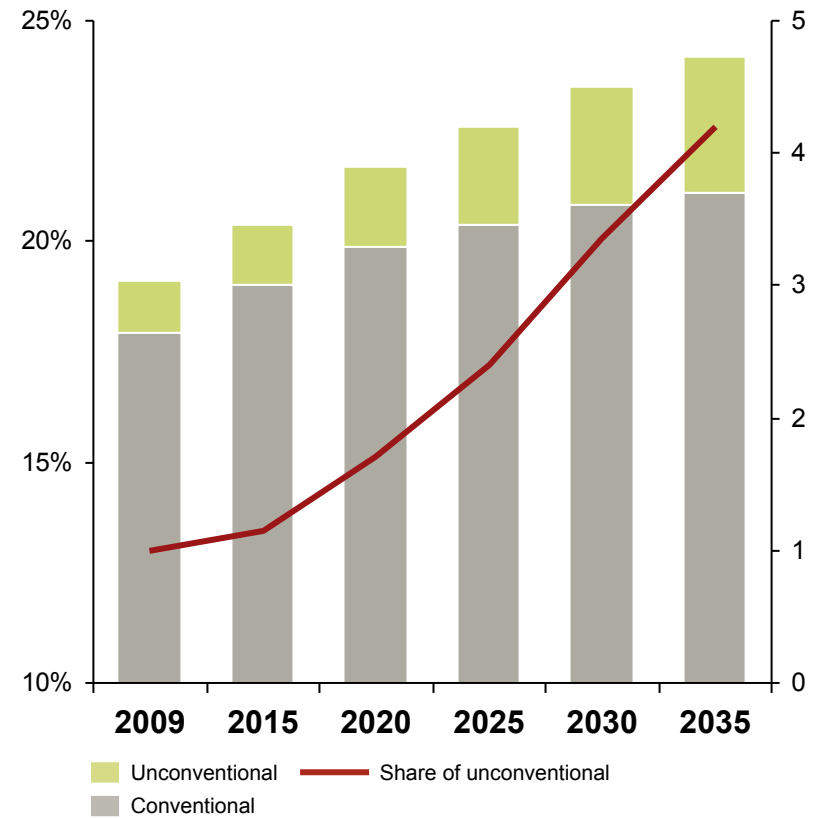
Annual production

(Share from new fields, in % – trillion m3)

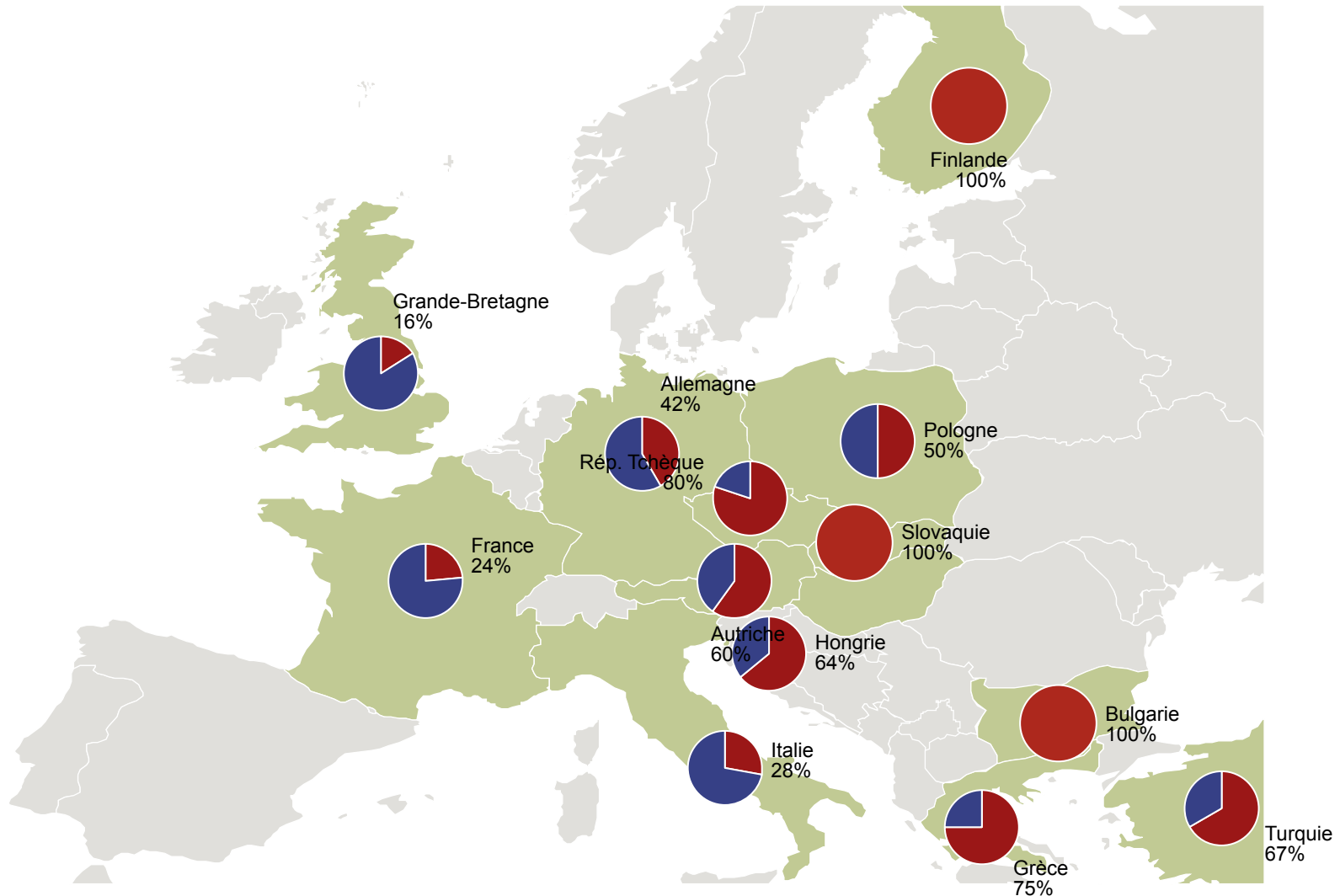


Type of production

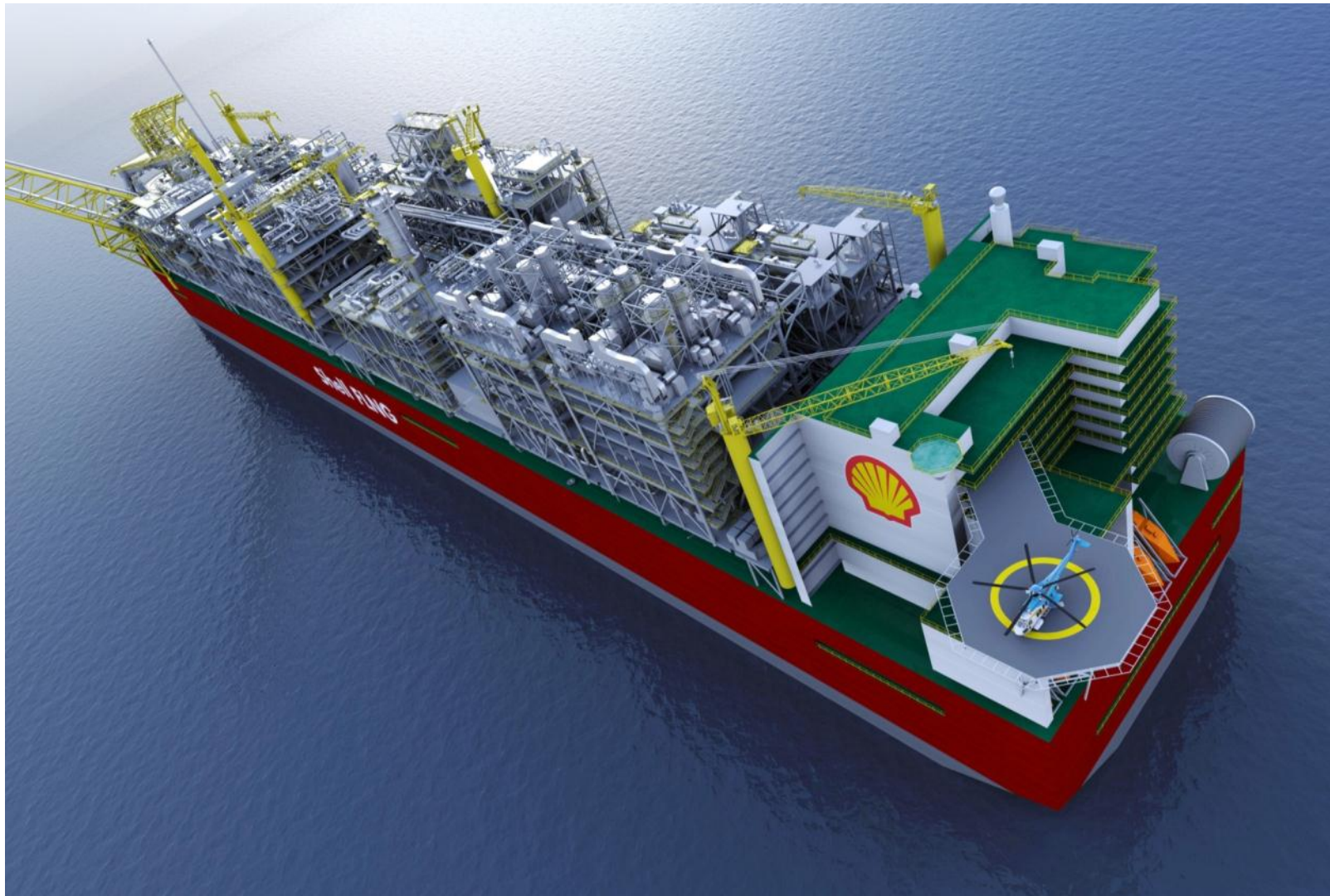
(Share of unconventional in % – Trillion m3)



Dépendance des pays européens vis-à-vis du gaz russe (en % du gaz russe dans la consommation annuelle nationale de gaz)



Prelude FLNG : la première unité flottante au monde de liquéfaction de gaz naturel - Australie



EPR Flamanville



Nuclear steam turbine (Alstom)



Small Modular Reactors

家庭に優しい無限エネルギー



今までの家庭用電灯線に比べて、電気料金が月々、約20%もお得です。また、原油等のエネルギー情勢の変化にも影響を受けないとなく、安定した電力がいつも得られます。

操作は簡単。お子様・お年寄りでもスイッチひとつで動かせます。安心設計の過熱保護回路付。小型核燃料棒（長さ約15cm）1本で、一般家庭の半年分の電力が得られます。また、使用済の燃料棒は専用シールドケースに入れて、一般不燃ゴミと一緒に捨てられます。

本体
定価1,310,000円（税別）
＜取付工事費は別途、申し受けます。＞
核燃料棒3本セット
定価137,000円（税別）

※使用上の注意
連続してご使用になった場合、体質によっては、まれにめまい、軽い手足の痺れ等を感じる場合があります。その際は、一時使用を中止して医師にご相談下さい。

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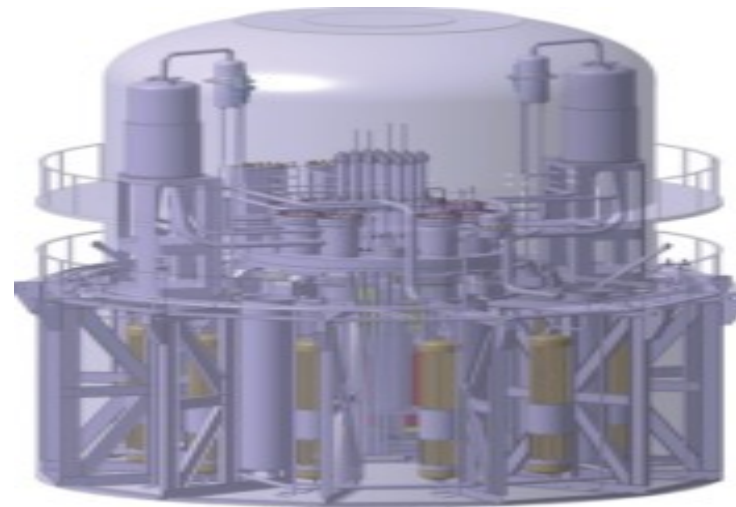
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Small Modular Reactors

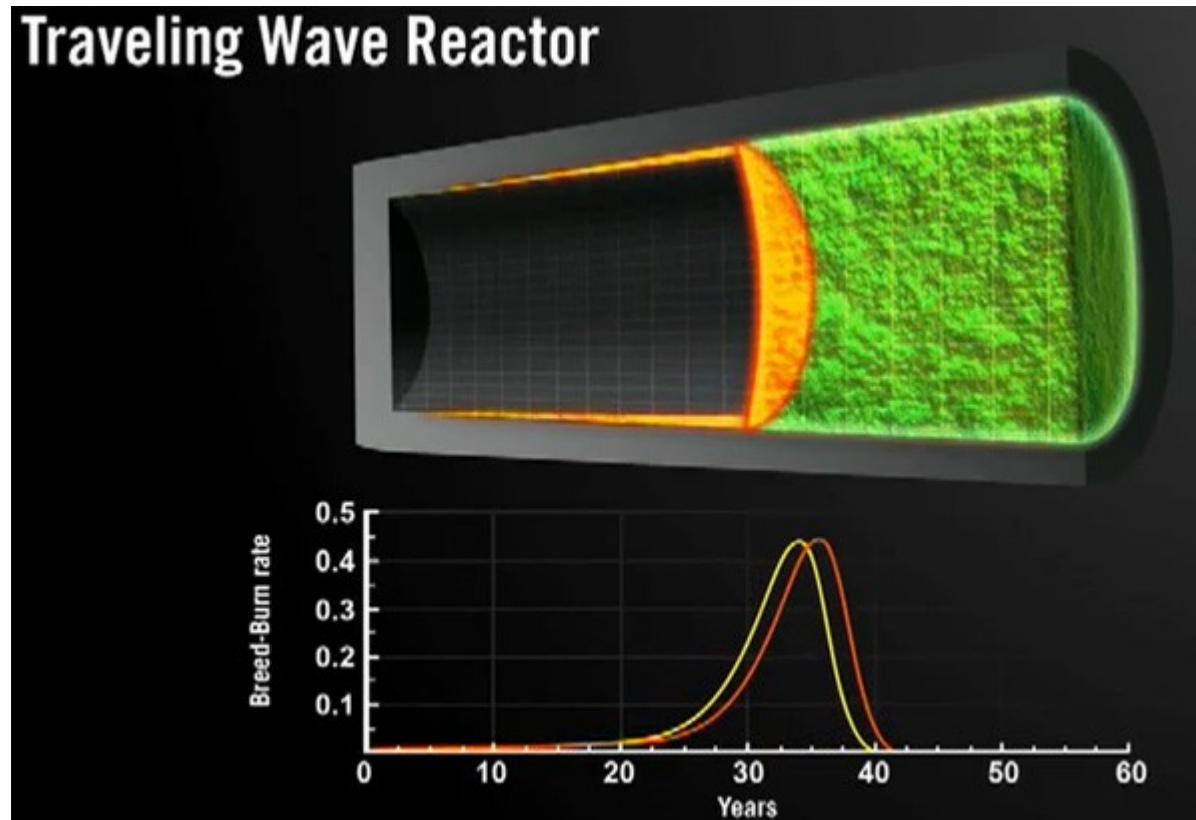
- Nuscale + Fluor 45MWe (PWR)



- SVBR Rosatom EN+ 100MWe (FNR)



Traveling Wave reactor (Lawrence Livermore/ TerraPower / Bill Gates)



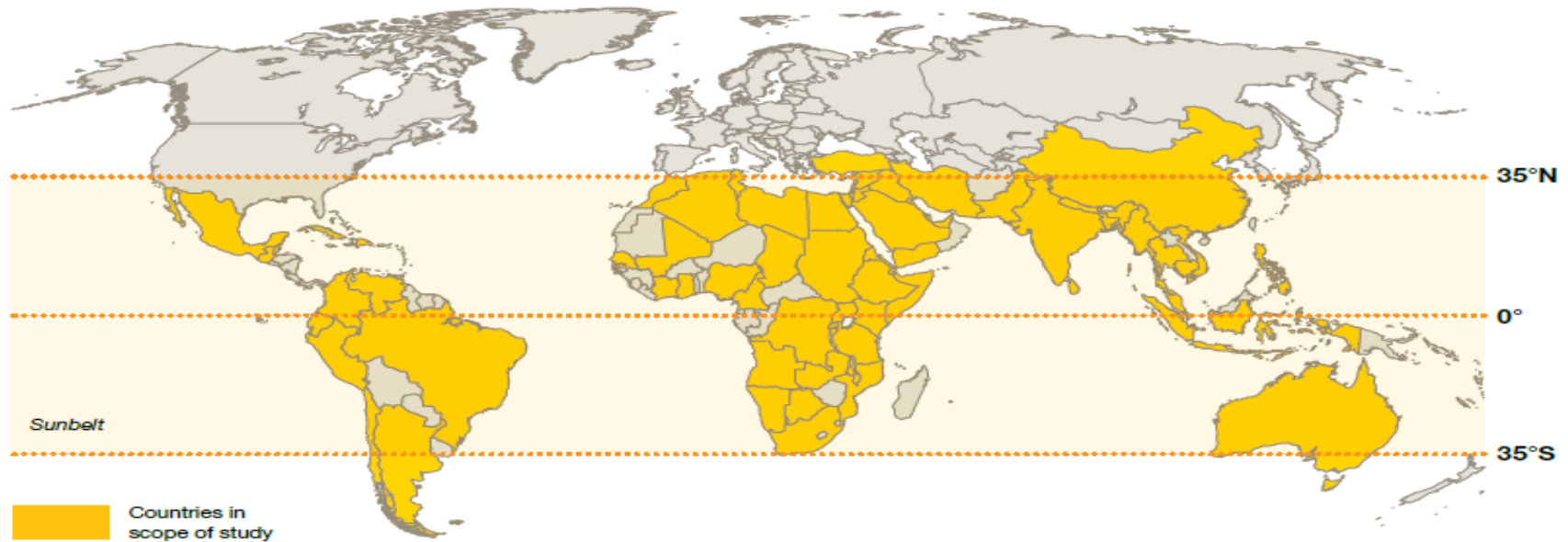
Wind tower new generation (Alstom)



Orientations for the Solar industry in Europe

- **Solar energies have a major role to play in the future European energy mix for the long term**
 - Solar is becoming competitive faster than expected
 - We need more ambitious objectives in Europe
- **Consistent and coherent long term support policy schemes are vital to maintain a solar industry in Europe**
 - Visibility is an absolute must for investors and entrepreneurs
 - Developing R&D and industrial capabilities in Europe is not impossible - is it too late?
 - A fair level playing field must be ensured for our European industry – subsidy policies?
 - Transition from subsidies to market through promotion of self consumption
- **Integration in electric systems have to be prepared and supported actively**
 - Grid integration
 - Transmission intra and inter countries
 - Administrative constraints
 - More flexible generation mix

The Sunbelt Region represents an enormous opportunity for solar energy



	Sunbelt countries in scope	All countries in Sunbelt	World
# countries (2008)	66	148	201
Population (2008)	5.0 billion	5.3 billion	6.7 billion
GDP (2008)	15.7 trillion	16.4 trillion	60.0 trillion
Electricity consumption (2007)	6,800 TWh	7,000 TWh	17,900 TWh

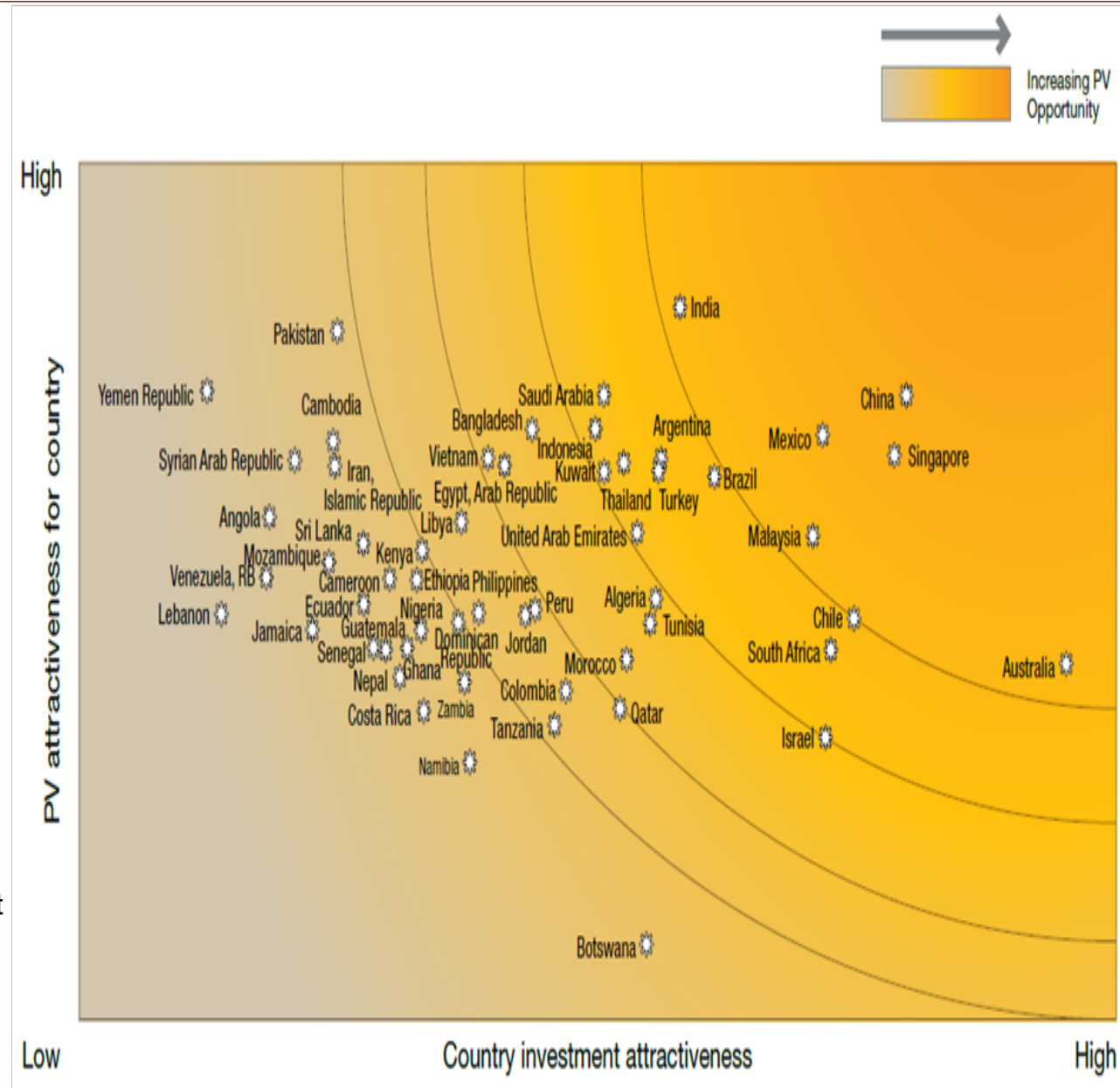
Solar power attractiveness

Attractiveness factors





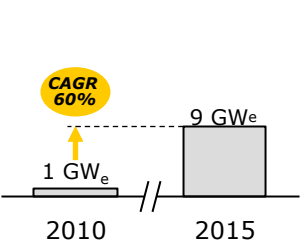
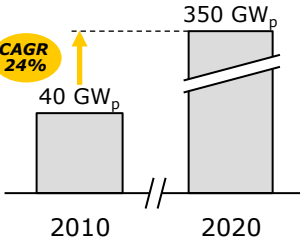
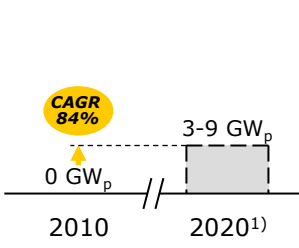
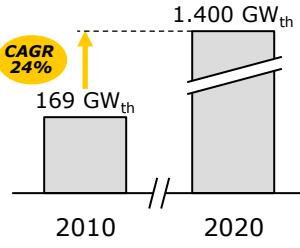
- Size of electricity market
- E-demand growth
- Solar cost competitiveness
- Generation portfolio
- Power grid losses
- Power grid coverage

Investment attractiveness





- Market potential
- Political and business environment
- Financial stability
- Policies on renewable energy






Solar market segments

		Electricity generation			Heat generation
		Concentrated Solar Power (CSP)	Photovoltaics (PV)	Concentrated Photovoltaics (CPV)	Solar thermal heating (STH)
					
Global Market size		 <p>2010 2015</p>	 <p>2010 2020</p>	 <p>2010 2020¹⁾</p>	 <p>2010 2020</p>
	Profitability and growth profile	<p>-10 to +35% ↘</p> <ul style="list-style-type: none"> • EBIT highly depending on value chain and market position • High growth but starting from 0 	<p>-15 to +25% ↘</p> <ul style="list-style-type: none"> • Large proportion of module manufacturers not profitable today • Margin depends on level of value chain integration and technology 	<p>n/a²⁾</p> <ul style="list-style-type: none"> • Relatively new technology • First projects and demand in the market 	<p>10% →</p> <ul style="list-style-type: none"> • Large volume, commodity business with relatively mature technology

Each segment has diverse customer requirements and geographic focus

		Electricity generation			Heat generation
		Concentrated Solar Power (CSP)	Photovoltaics (PV)	Concentrated Photovoltaics (CPV)	Solar thermal heating (STH)
					
Target customers		<ul style="list-style-type: none"> Utilities / IPPs (Industrial customers) 	<ul style="list-style-type: none"> Residential private households Commercial customers Industrial customers Utilities / IPPs 	<ul style="list-style-type: none"> Utilities / IPPs Industrial customers (Commercial customers) 	<ul style="list-style-type: none"> Residential private households Commercial customers (Industrial customers)
Competition level		<ul style="list-style-type: none"> Medium competition level. Mid sized player industry with major players in consolidation mode 	<ul style="list-style-type: none"> High competition level in all chains 	<ul style="list-style-type: none"> Competition starts to increase 	<ul style="list-style-type: none"> Mature market with average competition
Technologies		<ul style="list-style-type: none"> Parabolic Trough (PT) Solar Tower (ST) Linear Fresnel (LF) Dish Stirling (DS) 	<ul style="list-style-type: none"> Crystalline (c-Si, mc-Si) Thin film (a-Si, μ-Si, Cl(G)S, CdTE) Upcoming: organic, dye, nano 	<ul style="list-style-type: none"> Reflective mirror CPV Point Focus (HCPV) Linear Focus (LCPV) Refractive lens CPV 	<ul style="list-style-type: none"> Vacuum tube collector Flat plate collector
Geogr. focus		<ul style="list-style-type: none"> Direct irradiation Sunbelt countries and regions with high DNI (>2.000 kW/m²/a) Large areas of flat terrain 	<ul style="list-style-type: none"> Indirect and direct irradiation Efficiency decrease if very hot 	<ul style="list-style-type: none"> Direct irradiation 	<ul style="list-style-type: none"> Indirect and direct irradiation

3rd generation PV technologies have the potential to evolve into disruptive technologies

<p>Nanocrystalline Silicon/ Microcrystalline Silicon (nc-Si/mc-Si)</p>	<ul style="list-style-type: none">■ An improvement over a-Si■ Small grains of crystalline silicon within amorphous phase
<p>Dye-sensitized (DSSC)</p>  	<ul style="list-style-type: none">■ Based on a semiconductor formed between a photo-sensitized anode and an electrolyte■ Low cost, substrate flexibility, and ability to perform in dim light■ Targeted at larger application areas
<p>Organic/ Polymer</p> 	<ul style="list-style-type: none">■ Organic cells will find its application in lower power consumer applications

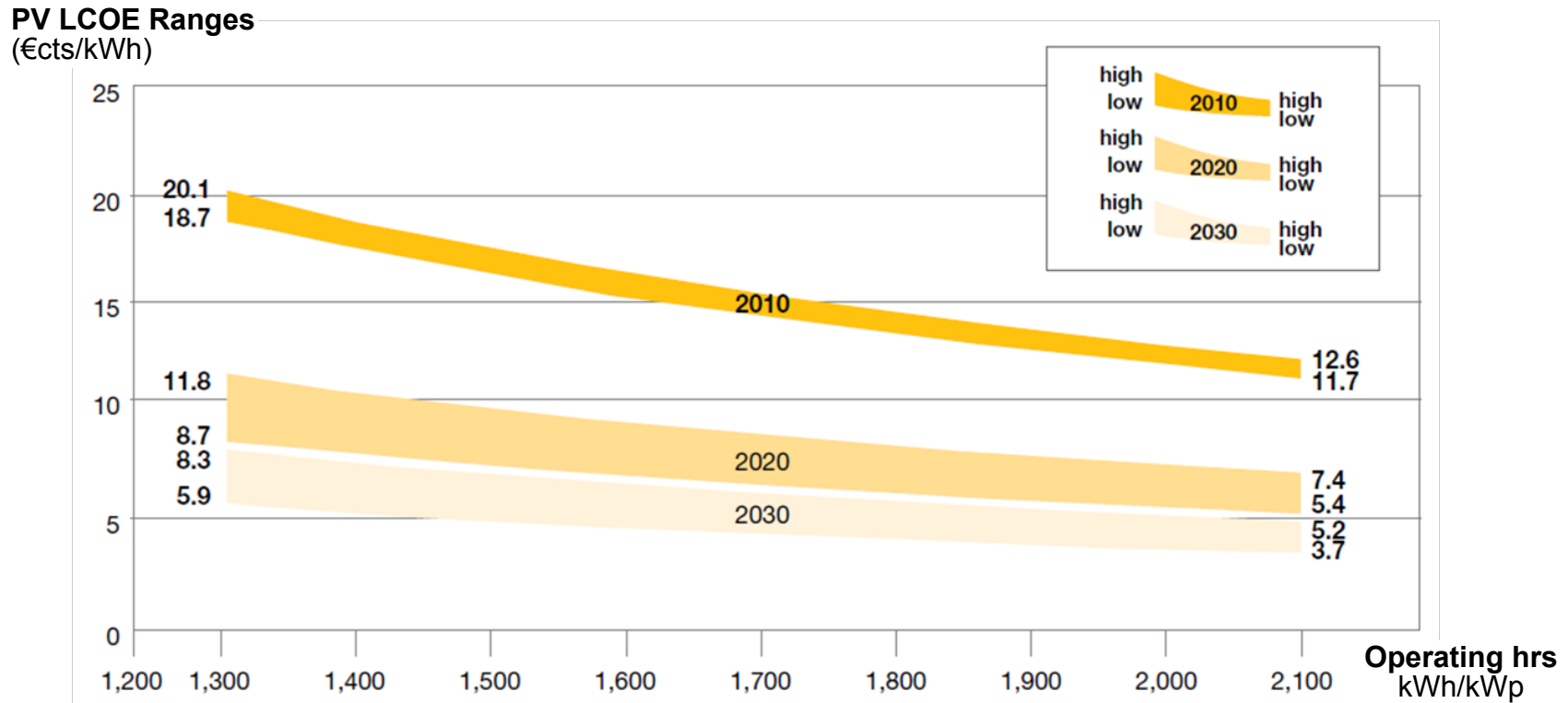
4th generation PV technologies

University of Chemnitz Solar Paper

- Solar panels printed on standard paper via ink with electrical properties
- **Very low production cost** as designed to be produced on conventional printing equipment
- **Current Energy conversion efficiency of 1.3% aiming for 5%**
- **Life time of 1 year**

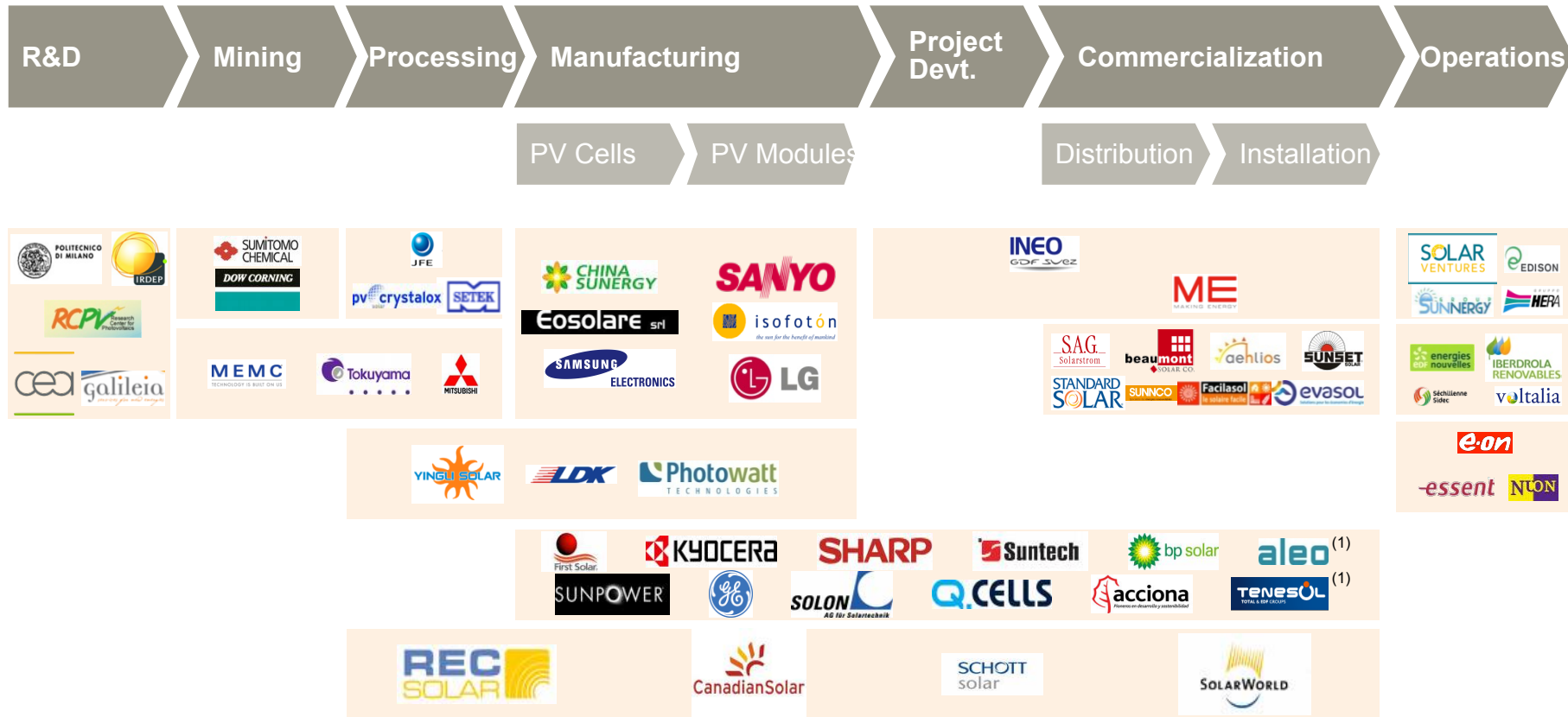


PV LCOE in Sunbelt could reach 4 to 8 €cts/kWh by 2030



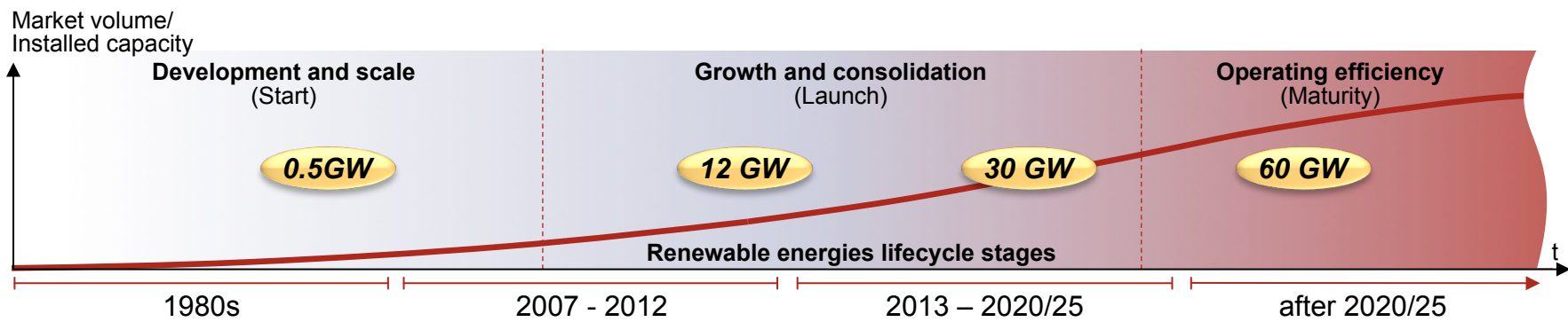
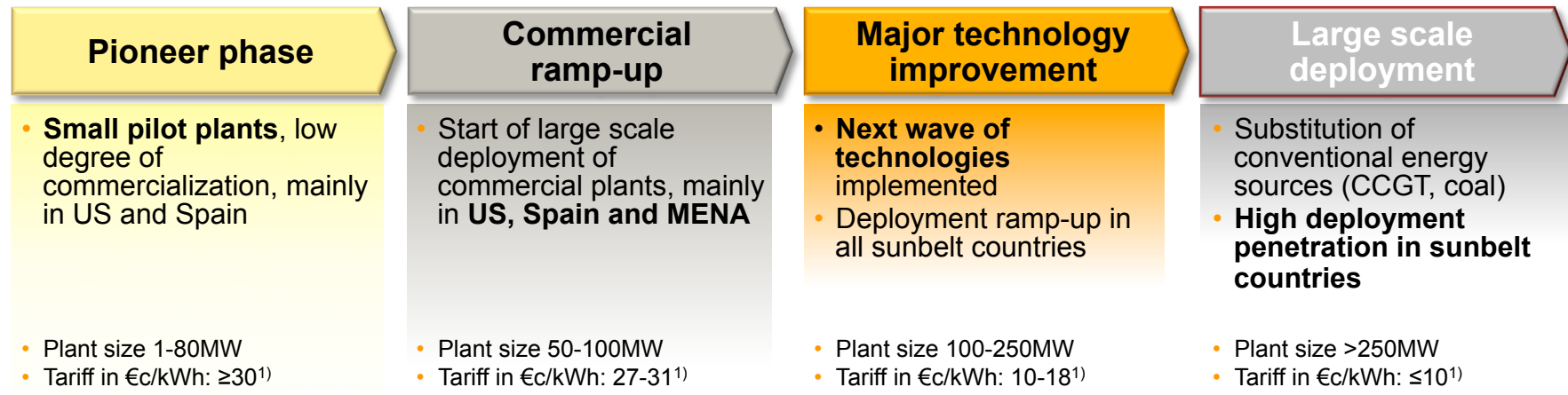
PV will be competitive with all peak load generation by 2020 and with mid-load by 2030

R&D and manufacturing is dominated by Asian actors. European and American actors are in difficulty.



1. Aleo and Tenesol do not produce PV cells
Source: A.T. Kearney analysis

High level CSP industry roadmap



En résumé:

- le temps du gaz est venu
- le nucléaire doit innover en production et en applications

Le coût de la sûreté (hydrocarbures, nucléaire) va augmenter

- l' éolien (offshore) va devenir plus que marginal
- le solaire doit encore abaisser ses coûts mais est très prometteur