

The BRGM is France's leading public institution in the Earth Sciences applications for the sustainable management of natural resources and surface and subsurface risks.

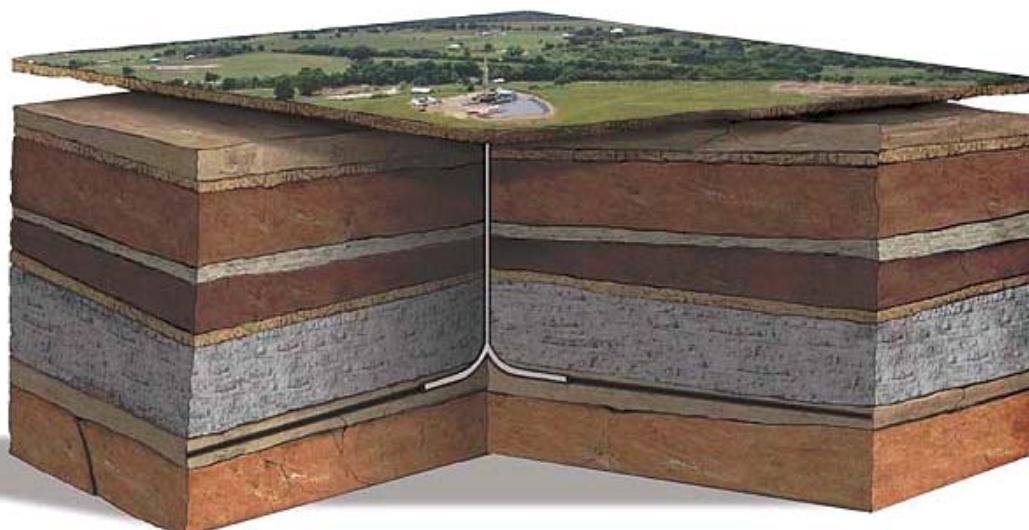
Key objectives

- > ***Understanding geological processes and associated risks***, developing new methodologies and techniques, producing and disseminating relevant, high-quality data.
- > ***Developing and supplying the necessary tools*** to manage surface and subsurface areas and natural resources, to prevent natural risks and pollution and to implement climate change policies.

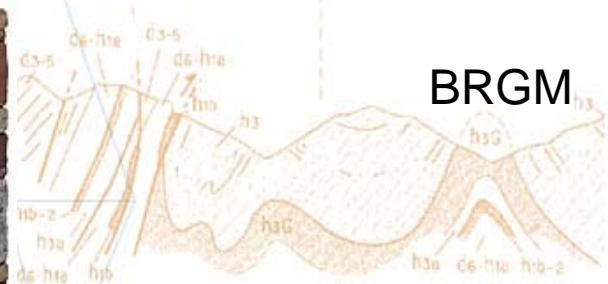


Shale gas in France

underground resources & legal situation

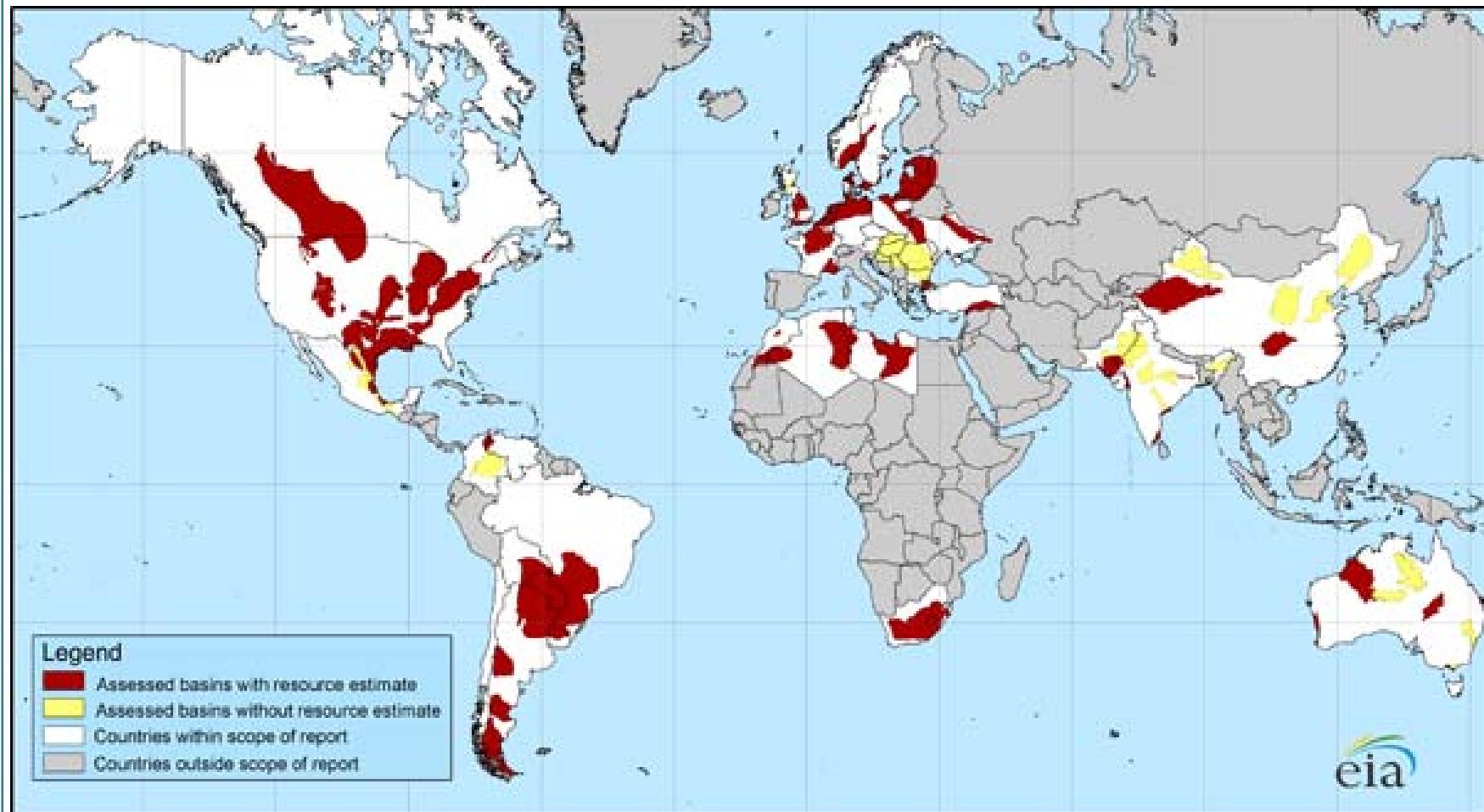


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European Affairs Advisor



Resource assessment of unconventional shale gas

Worldwide Shale gas resources



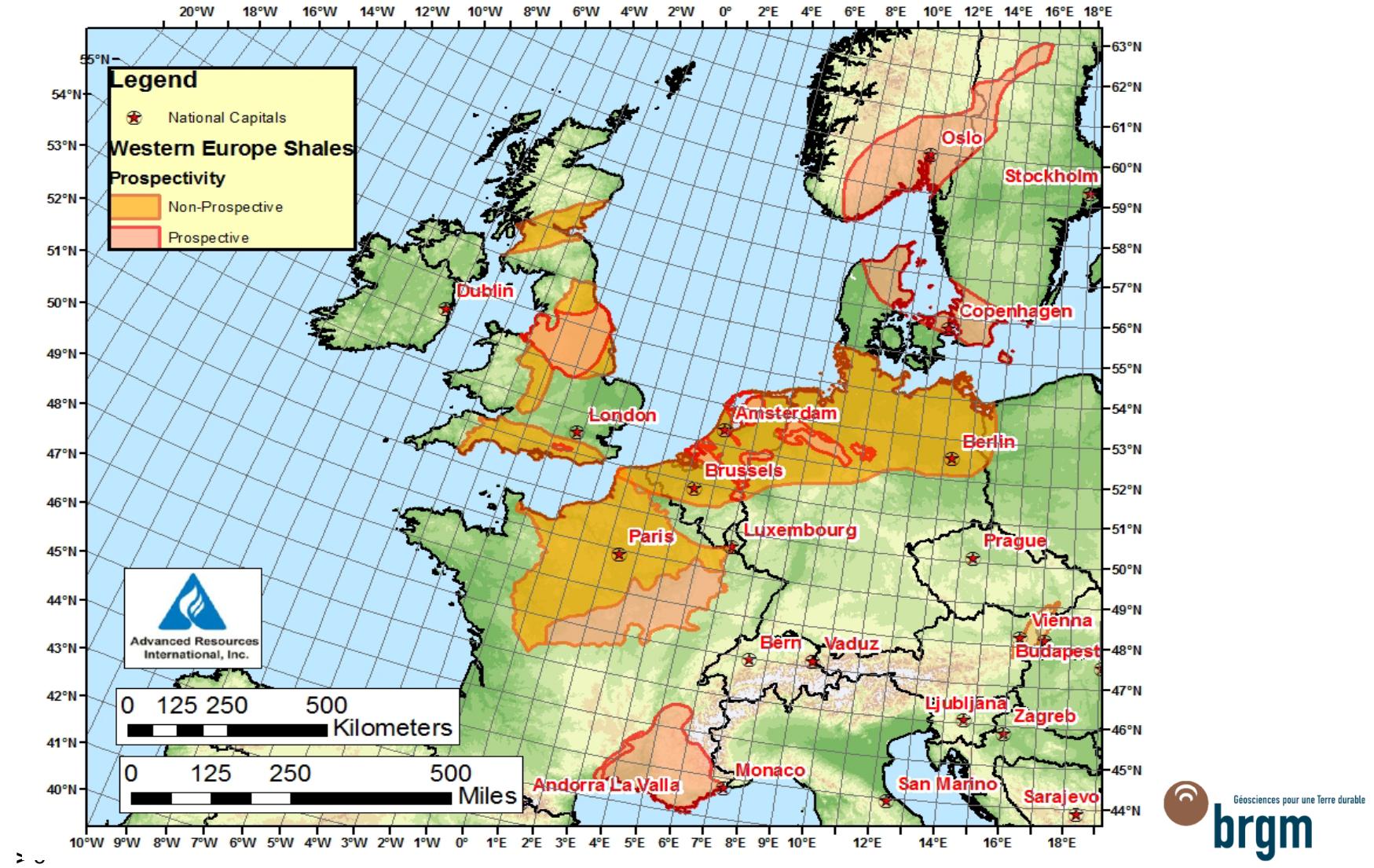
Worldwide resources : near 456 Tm³ - 180 are technically recoverable.

Europe : 6,5% - 30 Tm³

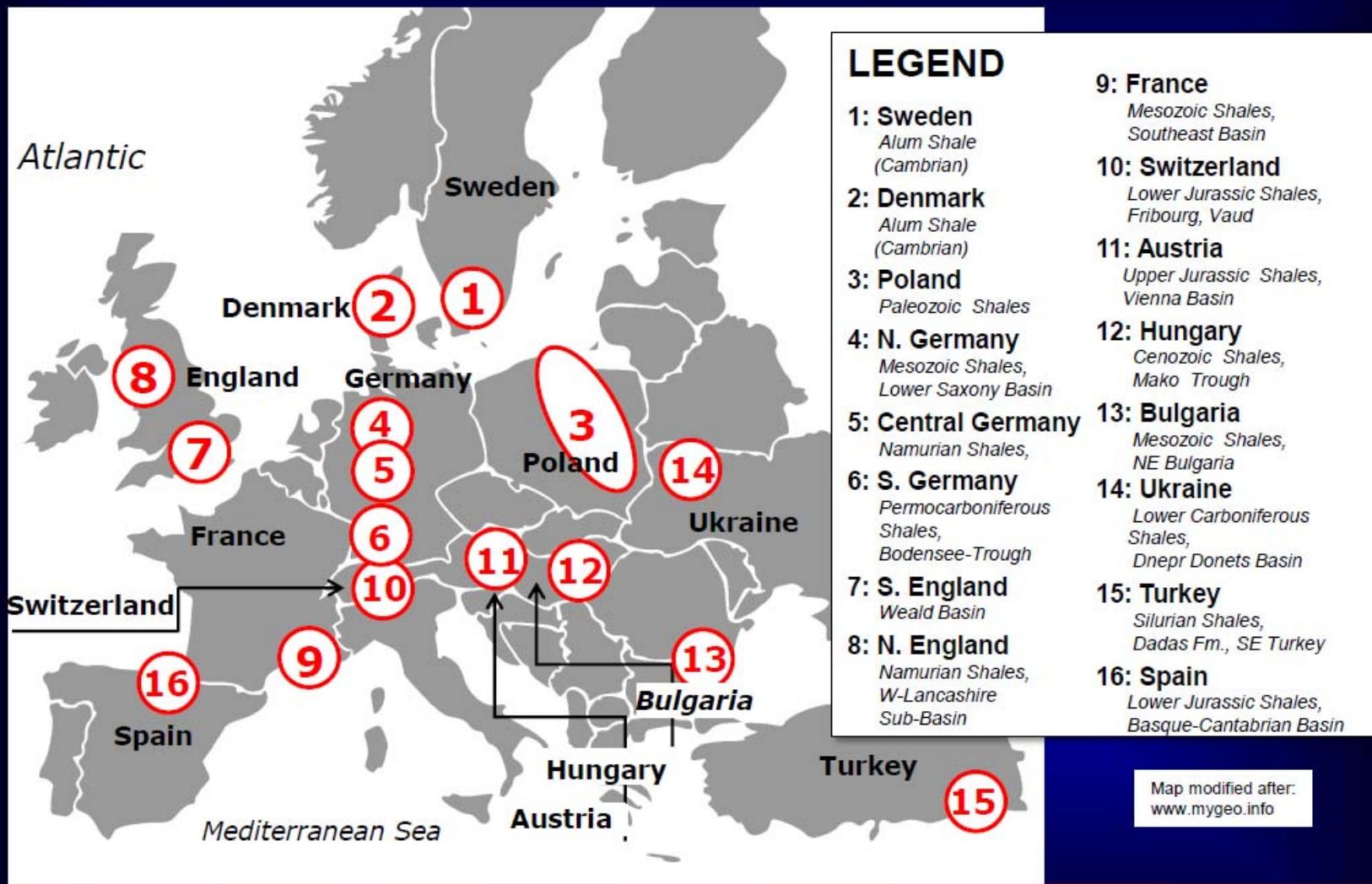
Poland & France : gas shale resources: 5 Tm³ for each.

Source :: U.S. Energy Information Administration based on Advanced Resources International, Inc. data

Unconventional Hydrocarbons / prospects in Europe



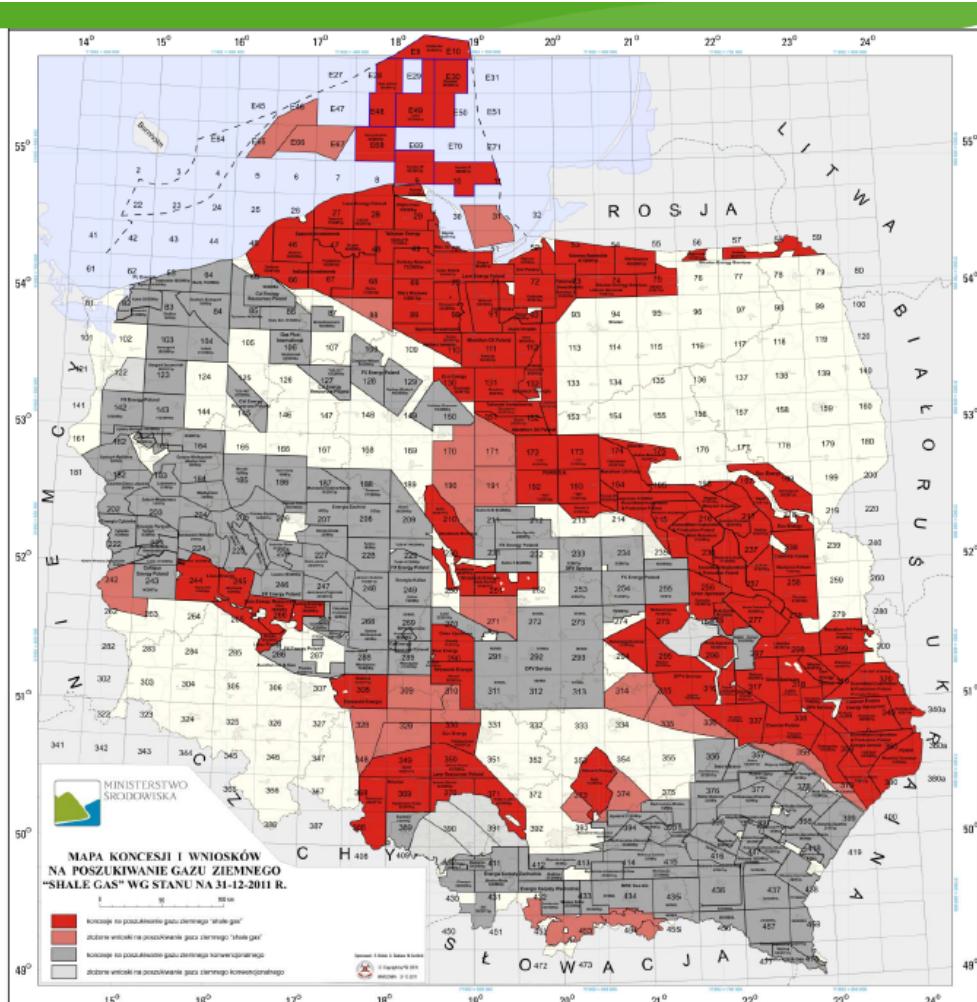
Activity in Europe 2011



Resource assessment of unconventional shale gas

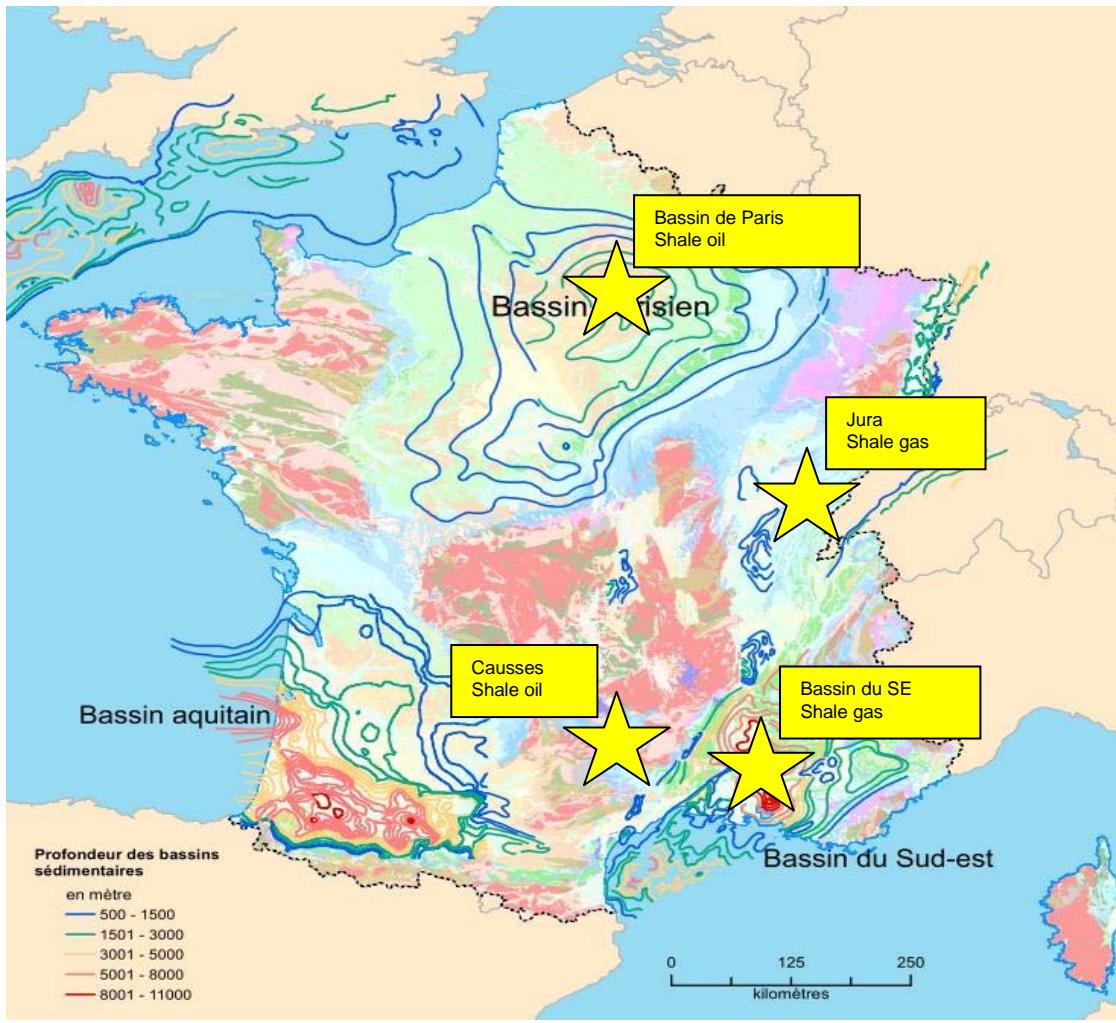
> Poland

- First assessment from US Energy Department:
 - 5.3 Tm³
- Revision from PGI
 - 1.9 Tm³ (35% less than expected)
- Shows difference between preliminary and updated estimations



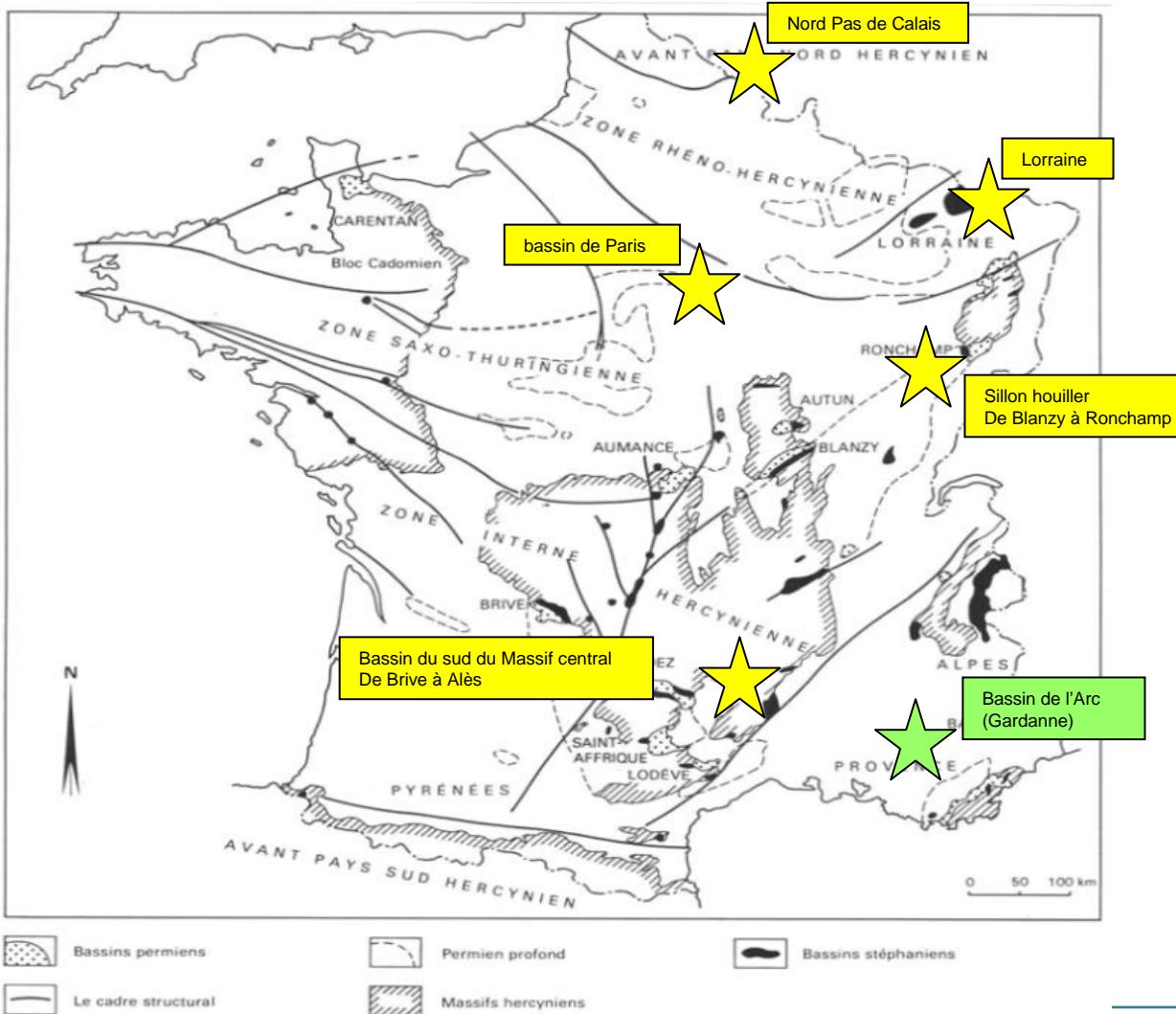
Potential resources in France

Jurassic targets (Toarcien...)
Shale oil & Shale gas



Potential resources in France

Permo-carbonifer targets Shale gas & Coal Bed Methane



Yellow: permo-carbonifère
(-245 à -345 Ma)

Green : Crétacéours
(-70 à -76 Ma)

Comparison USA - France for UC oils

	« Shale Oil » du Bassin parisien	Bakken
TOC	0 - 12% (moyenne = 5%)	0 - 40% (moyenne = 10%)
Tmax	445°C	445°C
Roche mère	Type II	Type II
Matière organique	Plancton marin + bactéries anaérobies	Plancton marin + bactéries anaérobies
Contenu quartzique	26% - 58%	20% - 68%
Environnement de dépôt	marin et anoxique	marin et anoxique
« Competent Layer »	Banc de Roc	Middle Bakken
Epaisseur nette	1 - 40 mètres	2 - 20 mètres
Porosité	Jusqu'à 12%	8 à 12%
Perméabilité	Jusqu'à 5mD	0,05 - 0,5 mD
Densité API	38°	42°

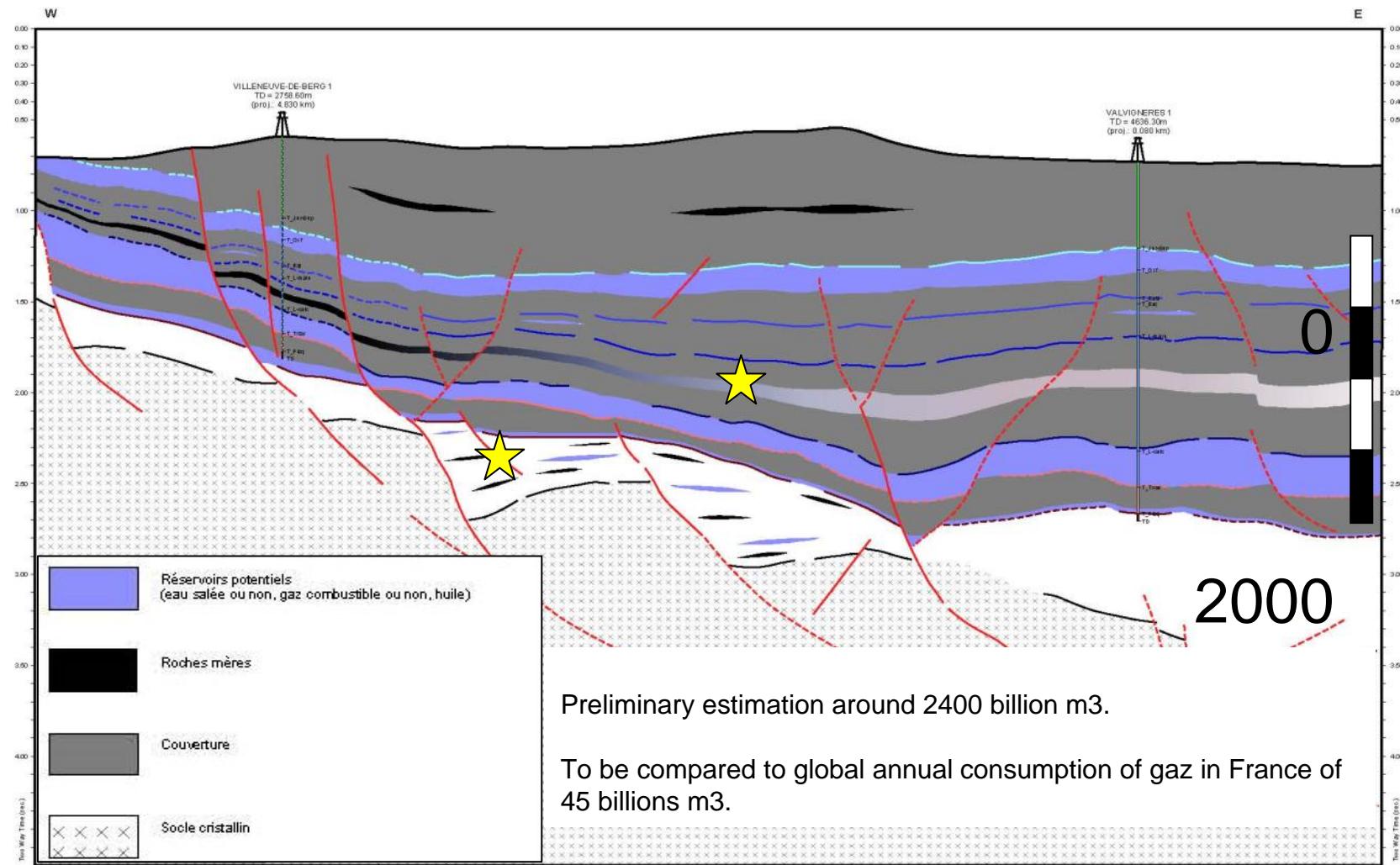
Source: Toreador à partir de données publiques

Bakken (USA / Canada), Toreador

> 10

Sources : www.toreador.net

Lias in South East Basin



Comparison USA – France – Shale gaz

	Gas shale South East Basin*	Gas shale Barnett Basin **
TOC	4 à 6%	4,5%
Tmax	500-510°C	455°C
Geology	Clays	Clays
Organic Matter	Type 2 probable	Type 2
Deposit Environment	Deep Marin	Limited Marine
Net length	200 m ?	90 m
Porosity	?	6%
Permeability	?	0,02 mD

* Organic geochemistry and thermal history of the Mesozoic series of the Ardeche Margin, Disnar, J.R., (1996),
Marine and Petroleum Geology

** Assessment of the Gas Potential and Yields from Shales: the Barnett Shale Model, Daniel M. Jarvie, Ronald J. Hill, and Richard M. Pollastro. in Cardott, B.J. (ed.), Unconventional energy resources in the southern Midcontinent, 2004 symposium: Oklahoma Geological Survey Circular 110, 2005, p. 37-50

Legal Framework in France

French Law of July 13rd 2011, notably :

- Prohibits exploration and extraction of hydrocarbons using Hydraulic Fracturing
- Establish a procedure to review permits granted for exploration of hydrocarbons
- The operators had two months to produce a report on the necessity to use fracking technology in order to explore the resources
- French government had one month to assess the report and make decision on the possible cancellation of existing permits

Based on the application of the precautionary principle

Technical guidance document

Guide sur la maîtrise des impacts et risques liés à l'exploitation des hydrocarbures de roche-mère : enjeux, verrous et pistes de recherche (September 2011)

http://www.developpement-durable.gouv.fr/IMG/pdf>Note_GHRM_Maitrise_des_risques_et_impacts.pdf

Revision of the the Mining Code

- Creating an instance involving community associations and professionals, NGOs, lawyers and trade unions to propose changes to Mining Code (Commission TUOT);
 - Reconciliation of mining law and environmental code;
 - Strengthening public participation in the allocation of mining projects;
 - Brainstorming on fiscal issues of the development of mines in France
- The report will be submitted to the Ministers in charge of mines at the end of December 2012

Conclusions for France

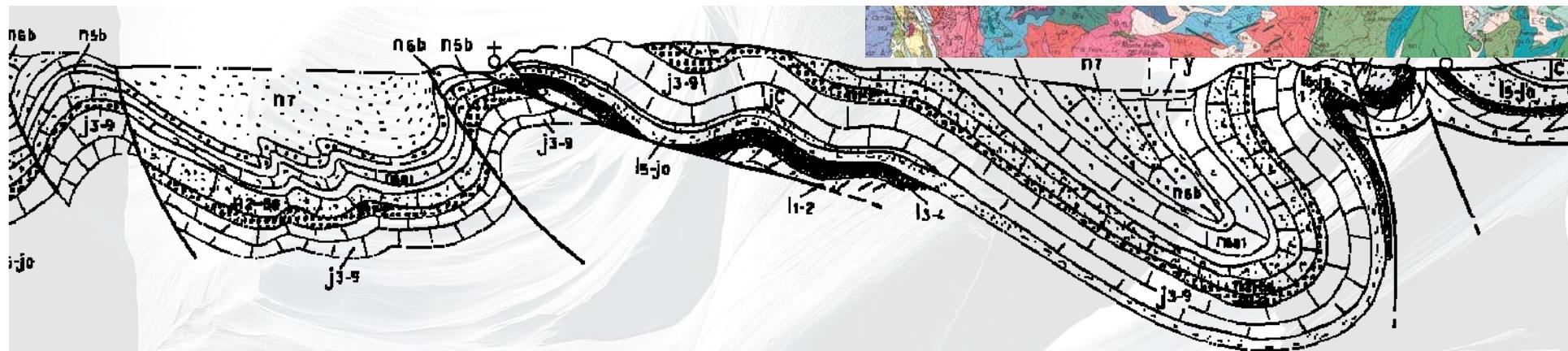
- > **No detailed information on resources:**
 - Shale Gaz or Oil
 - Estimation from a limited number of drilling
 - Assessment uncertainties on resource availability and accessibility
- > **No further exploration of shale gaz or oil until alternative technology to hydraulic fracking is available**
- > **Scientific monitoring on evolution of technologies and related impacts / risks**

Thanks for your attention



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