



The new French Wind Tariff System: Presentation, Potential and Consequences for Onshore and Offshore Projects

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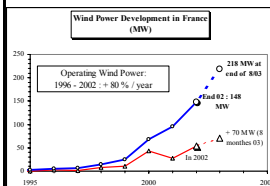
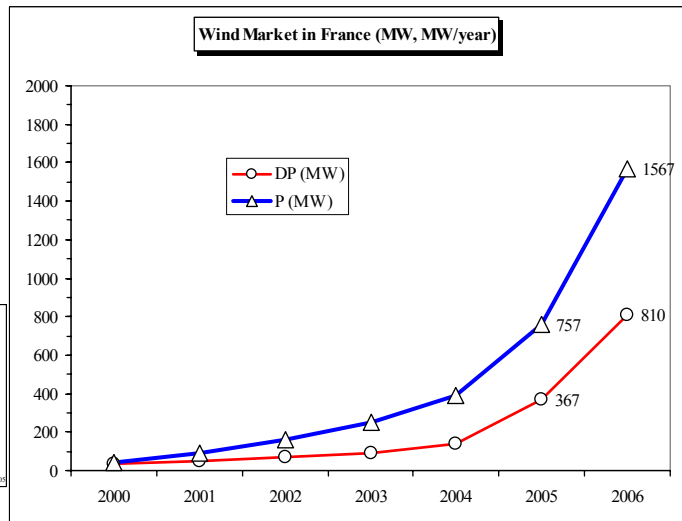
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From HUSUM 2003 to HUSUM 2007...

...and from the 2001 French Wind Tariffs System to the 2006 one





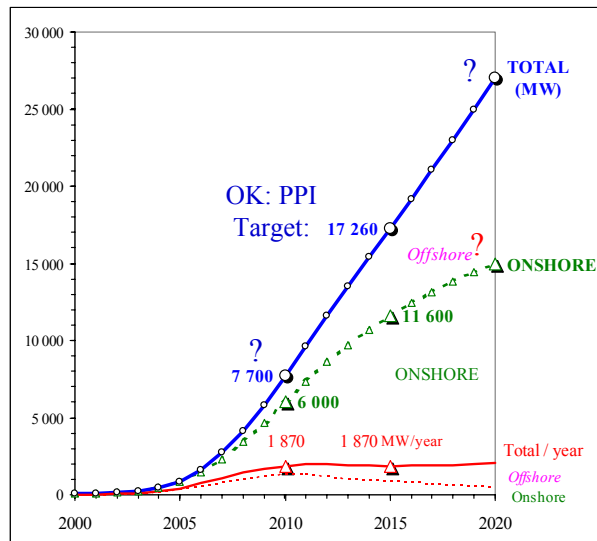
Between 2003-2006: changes in Energy Policy Context

- ❑ **A new "Energy Law" setting the short to long term energy policy framework and targets was passed on July 13th 2005**
 - ⇒ "POPE law": "Loi de Programme fixant les Orientations de la Politique Energétique"
- ❑ **Long term 2050 target for GHG decrease: -75 % from 1990 level**
- ❑ **For renewables, emphasis on 2010 contribution:**
 - ⇒ 10 % of total primary energy consumption from RES (around 6 % in 2004)
 - ⇒ **21 % target of RES for electricity in 2010 confirmed (vs 14 % in 1997)**
 - ★ This would require + 50 TWh compared to 1997 contribution
 - ★ 2005 actual contribution around 12 % (very low Hydropower production)
 - ⇒ + 50% contribution from thermal renewables compared to 2004 contribution (+ 4 Mtoe from renewable heat from 2004 to 2010)
 - ⇒ 5.75 % of biofuels in transports confirmed, by 2008 and not by 2010

3



...But Husum 2003 total market still valid for 2015-2020



Source: B. Chabot, ADEME, Husum Wind 2003

4



RE Feed-In Tariffs after the “POPE” Law (1)

- ❑ **The July 13th 2005 POPE law demanded for 2006:**
 - ⇒ To determine if profitability from RE tariffs was “Normal”
 - ⇒ To propose new tariffs according to this analysis
- ❑ **Results of analysis from Ministry of Industry:**
 - ⇒ Profitability from 2001-2003 RE tariffs was not beyond “normal levels” and in fact was too low in some cases
 - ⇒ New “2006 tariffs” already published :
 - ★ Photovoltaics (much better ones)
 - ★ Biogas (much better ones)
 - ★ **Wind Power, onshore and offshore**
 - ★ Geothermal Power
 - ★ Small Hydropower
 - ⇒ Other “new tariffs” to be published in 2007:
 - ★ Electricity from Biomass
 - ★ Electricity from MSW



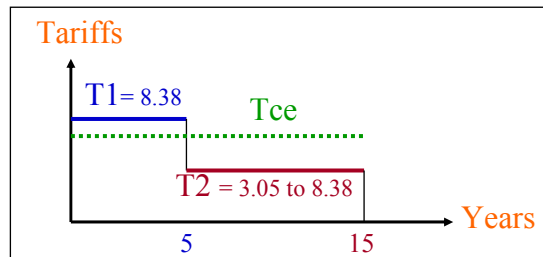
Context for Wind Power after the “POPE” Law (1)

- ❑ **Two parallel mechanisms:**
 - ⇒ Power purchase obligation and Feed-in Tariffs
 - ⇒ Competitive calls for tender launched by CRE on behalf of Ministry of Industry within the “PPI” requirements
- ❑ **To benefit from the power purchase obligation and feed-in tariffs:**
 - ⇒ New projects must be located within a “ZDE”:
 - ★ **“Zone de Développement de l’Eolien”**: “Zone for Wind Power Development”
 - ★ Up to local municipalities to ask or not for minimum and maximum limits for wind farms rated power ([the “12 MW limit” is no longer mandatory](#))
 - ⇒ Except up to July 12 / 2007 for projects with already a complete file for application for building permit and eligible to the power purchase obligation (less than 12 MW)
- ❑ **EIA & public inquiry mandatory if hub height > 50 m**



Changes in wind tariffs : 2001 tariffs (up to July 2007)

- ❑ **Two successive tariffs levels :**
 - ⇒ T1 fixed for all projects from years 1 to 5
 - ⇒ T2 variable for projects from years 6 to 15
 - ⇒ T1 and T2 define a virtual constant “equivalent tariff”, Tce
- ❑ **For a specific project :**
 - ⇒ N_h = averaged E_y / P from values years 1 to 5 (hours/year)
 - ⇒ T2: linear calculation from values at $N_{hr} = 2000, 2600, 3600$
 - ⇒ Tce from (T1, T2, t = real discount rate = AWCC before tax)



7



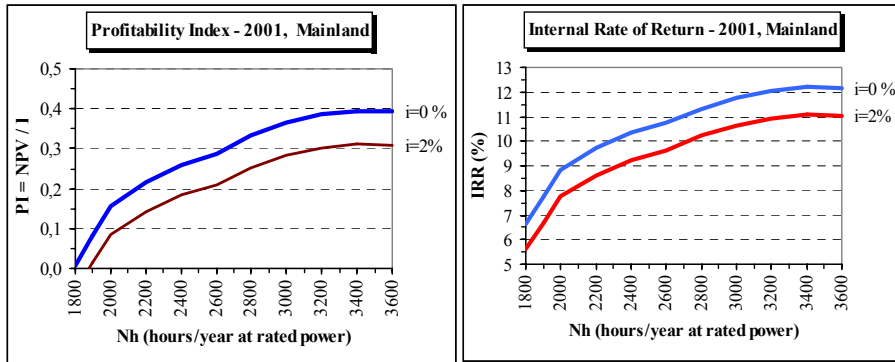
2001 Tariffs up to 6/2007 PPAs: Other “Details”

- ❑ **Indexation for tariffs within a specific contract:**
 - ⇒ Only 60% ==> decrease of profitability with inflation rate
- ❑ ~~Two sets for N_{hr} min, max & intermediate ref. values:~~
 - ⇒ “Favourable” till sums of signed contracts is under 1.5 GW
 - ⇒ “Less favourable” after 1.5 GW of signed PPA (2005?):
 - ★ $N_{hmin} = 1900$ hours/year instead of 2000, $N_{hint} = 2400$ instead of 2600 and $N_{hmax} = 3400$ instead of 3600
- ❑ **Provisional tariffs decrease for years 2003-6/2007 PPAs:**
 - ⇒ -3.3 % per year from 2003 (current EUROS)
 - ⇒ Formula for correction from inflation from 2003+

8



Tariffs: 2001 reference profitability (Mainland)



Reference case

- ⇒ $I_u = 1067$ EUR/kW. Value at year 16: 15% of initial invest.
- ⇒ Yearly O&M expenses: $K_{om} = 4\%$ of initial investment
- ⇒ Mean inflation rate 2001 - 2015: $i = 0\%$ or $i = 2\%$ / year
- ⇒ Profitability index: NPV per € invested

9



French Wind Feed-In Tariffs after the “POPE” Law

No important changes on:

- ⇒ Basic principles: tiered tariff system : T1, then $T2 = f(Nh)$
- ⇒ Same project performance ratio $Nh = E_y / P$
- ⇒ First period for T1: 10 years
- ⇒ $n = 15$ years for onshore projects, $n = 20$ years for offshore
- ⇒ Same formula for tariff protection against inflation within a contract: 60 % corrected by variation of ICHTTS & PPEI index

Based on a “reference project target profitability”

- ⇒ Project economic profitability before tax on profit
- ⇒ “Real 8 % Internal rate of return before tax” for typical AWCC (from debt and equity) of $t = 6\%$ real

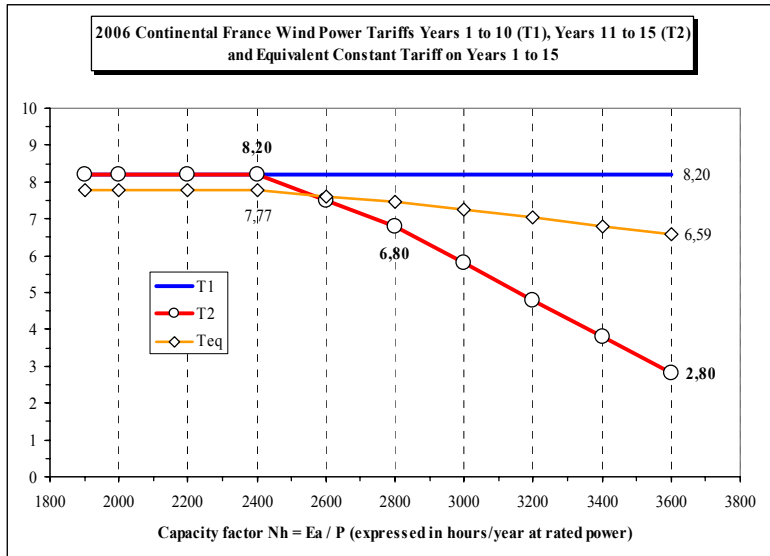
Decrease rate for new contracts:

- ⇒ - 2 % per year, from 2007
- ⇒ 100 % adjusted from variation of ICHTTS & PPEI index

10



July 2006 onshore wind power tariffs

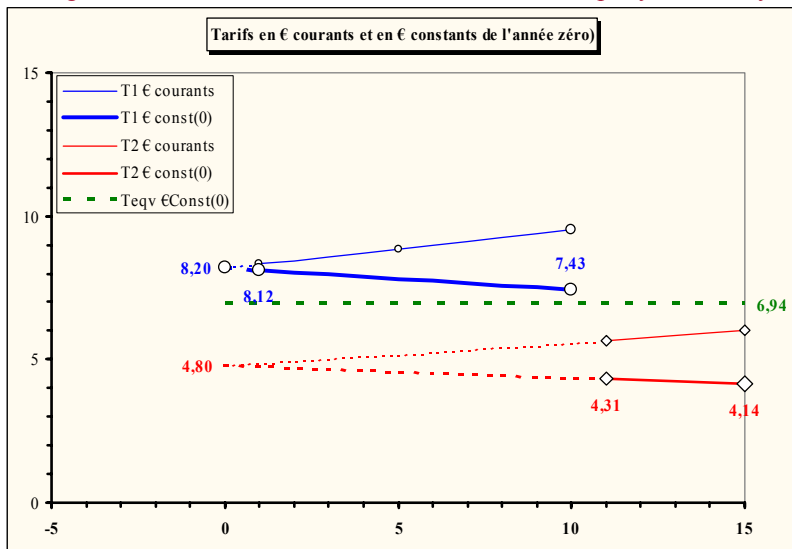


Equivalent constant tariff TV_{eq} are calculated here with a 6% real discount rate and a 2% inflation rate



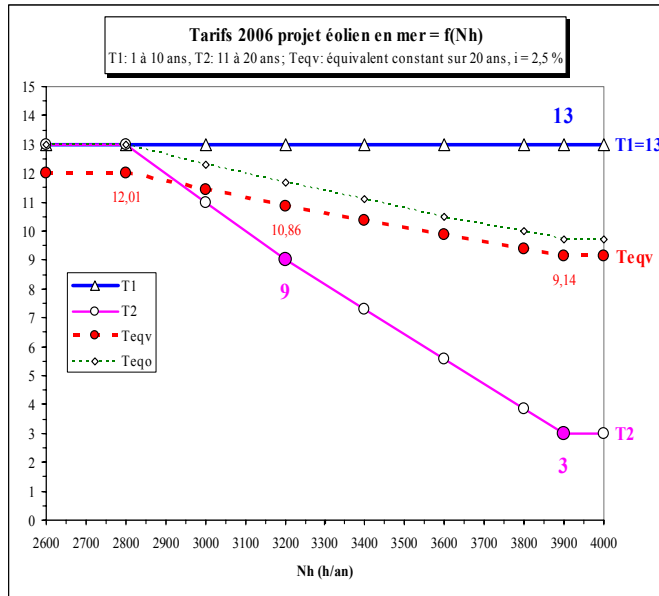
Example of a 2006 onshore wind power tariff

3200 h/year project tariff evolution in current € and in constant € of year 2006, assuming $t = AWCCC = 6\%$ real, inflation rate $i = 2,5\%$ per year on 15 years





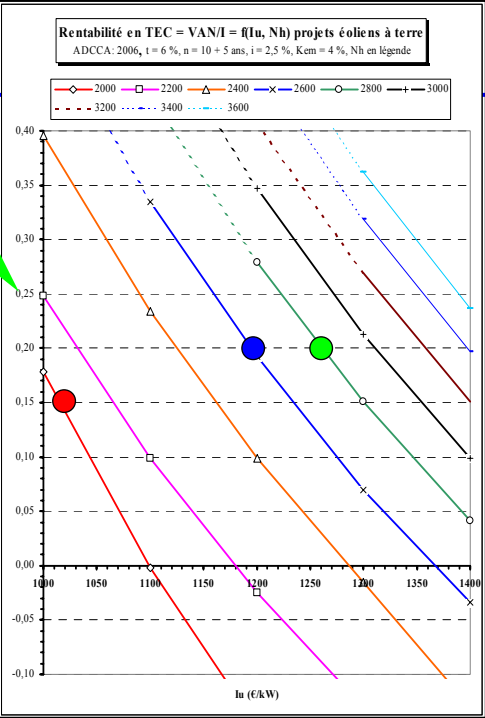
July 2006 French Wind Offshore Tariffs



Onshore 2006 Profitability

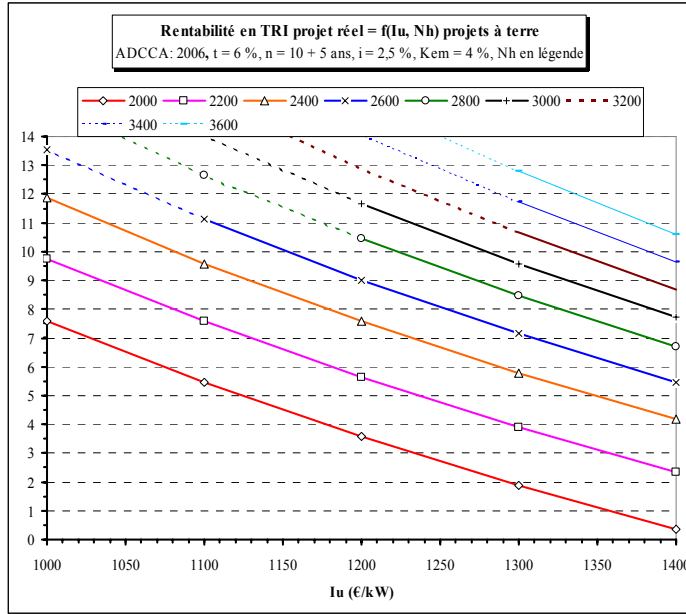
- ❑ **AWCC = t = 6% real, i = 2.5 %/year, Kom = 4%**
- ❑ **Example 1 (blue dot):**
 - ⇒ $I_u = 1200 \text{ €/kW}$
 - ⇒ $N_h = 2600 \text{ h/year}$
 - ⇒ $PI = 0.19$
- ❑ **Example 2 (red dot):**
 - ⇒ Targeted $PI = 0.15$
 - ⇒ $N_h = 2000 \text{ h/year}$
 - ⇒ I_u must be $< 1200 \text{ €/kW}$
- ❑ **Example 3 (green dot):**
 - ⇒ Targeted PI mini = 0.2
 - ⇒ $N_h = 2800 \text{ h/year}$
 - ⇒ I_u must be $< 1270 \text{ €/kW}$

PI target values





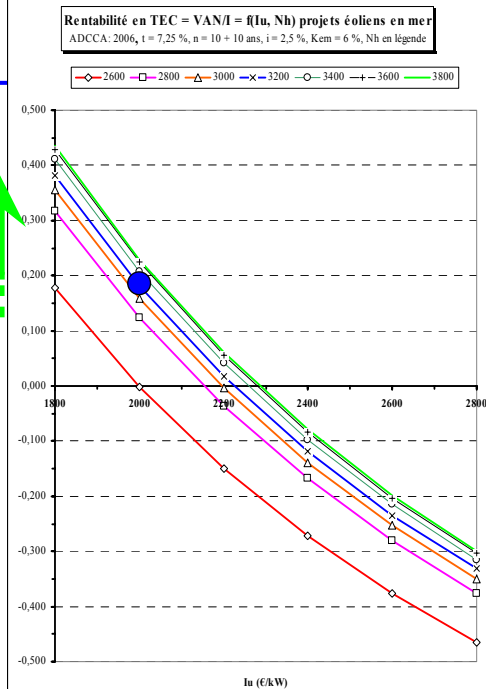
Onshore 2006 project real IRR before tax (t = AWCC = 6 % real, i = 2,5 % per year on 15 years)



Offshore Profitability

- ❑ AWCC = t = 7.25% real, i = 2.5 %/year, $K_{om} = 6 %$
- ❑ Example 1 (blue dot):
 - ⇒ $I_u = 2000$ €/kW
 - ⇒ $N_h = 3200$ h/year
 - ⇒ PI = 0.18

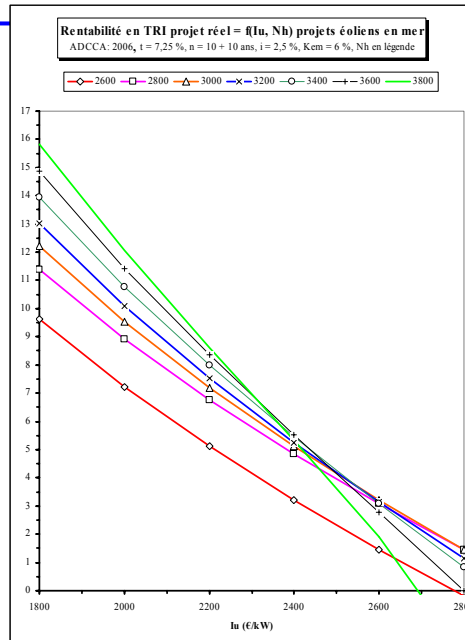
PI target values





Offshore 2006 project real IRR before tax

- AWCC = $t = 7.25\%$
real, $i = 2.5\%$ /year,
 $K_{om} = 6\%$



17



Conclusions

- 2001 feed-in Tariff confirmed as the main wind development driver in France
- New July 2006 procedures and tariffs can be also efficient
 - ⇒ No longer 12 MW and 1.5 GW PPAs limits for onshore projects
 - ⇒ Same basis for tariff system, but better profitability only on windy sites with present cost of onshore wind projects
- Experience is needed to test offshore wind tariffs from actual projects costs and performance
- Future French wind targets from the “3 times 20 % in 2020” European policy will probably require a continuity in success based on fair and efficient tariffs

18