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FIT for the Future

Feed-In tariffs (FITs) and their application in the United States

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Fair and Efficient tariffs for Feed-In Regulation: Experience from France

Bernard CHABOT

Senior Expert,

ADEME

500 route des lucioles - 06560 Valbonne - France

E-mail: bernard.chabot@ademe.fr

www.ademe.fr

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What are “Fair and Efficient Tariffs” ?

❑Fair:

- ⇨Recognise RE electricity value from different RE sources
- ⇨Pay for externalities differences in favour of RE electricity and fossil based power and which are not rewarded by the market
- ⇨ Give a chance to new and promising RE technologies against established power technologies, before they become cost competitive
- ⇨Allow a fair profitability for investors: not an insufficient one nor and undue one

❑Efficient:

- ⇨Attracting a sufficient number of various investors
- ⇨Mobilising adequate levels of debt and equity
- ⇨Sufficient projects profitability to finance an accelerated RE industry growth and development

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Basis for « Fair and Efficient tariffs »

- **Regulation by prices (« carrot ») vs quantities (« stick »)**
  - ⇨Developing renewables requires markets regulation
  - ⇨Regulation by prices : more efficient, less costly, more simple, compatible with liberal economy, created industries
  - ⇨History: Dk 90's, Germany (EEG), Sp, France… Ontario…
- **A tariff system adapted to technologies and applications**
  - ⇨Wind: onshore, offshore, PV, SHP, Biomass & Biogas
- **If various cases, a system adapted to different sites**
  - ⇨Wind: examples Germany, France, Portugal…
- **Anticipating performance and cost progress (Germany, F)**
- **Integrating protection against negative inflation impacts**
- **Simple system, procedures, contracts, problems solving**
- **Integrating monitoring and possibility of adaptation**
- **Over-cost passed on all electricity consumers**

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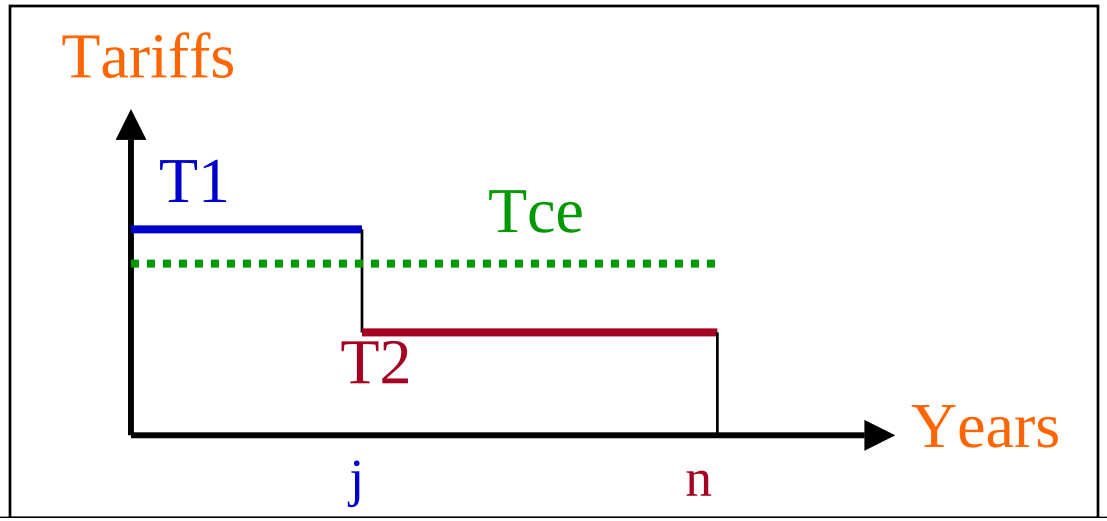
Example of the French onshore wind tariffs

- **Two successive tariffs levels :**
  - ⇨T1 fixed for all projects from years 1 to 5 (> 7/2006: 1 to 10)
  - ⇨T2 variable for projects from years 6 to 15 (>7/2006: 10 to 15)
  - ⇨T1 and T2 define a virtual constant “equivalent tariff”, Tce
- **For a specific project :**
  - ⇨Nh = averaged Ey / P from values years 1 to 5 (hours/year)
  - ⇨T2: linear calculation from reference values of Nh = Ey / P
  - ⇨(Tce from (T1, T2, t = real discount rate = AWCC before tax)



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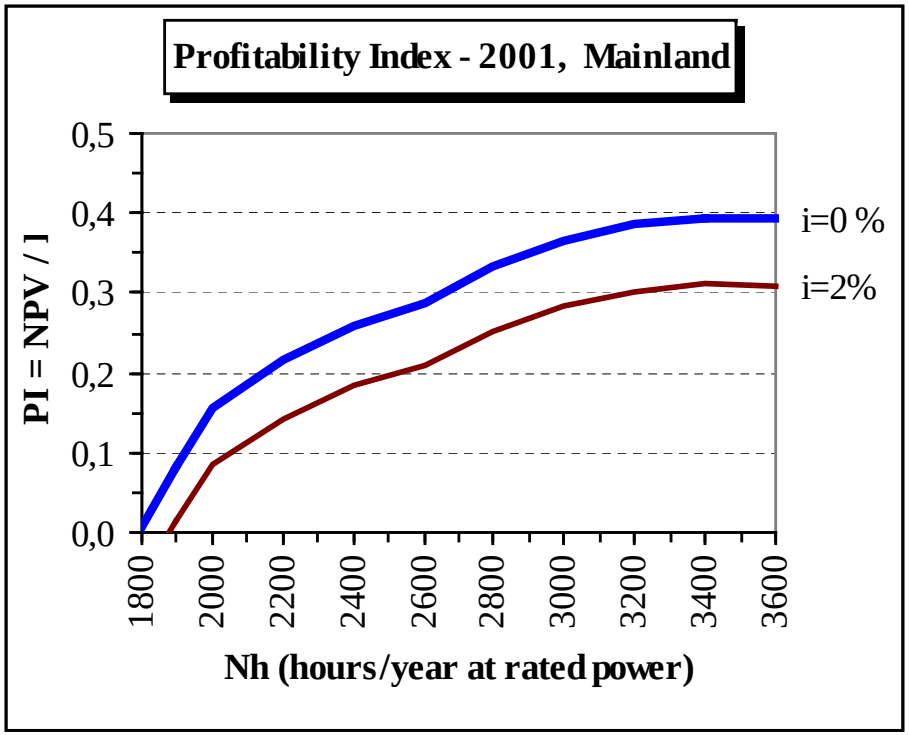
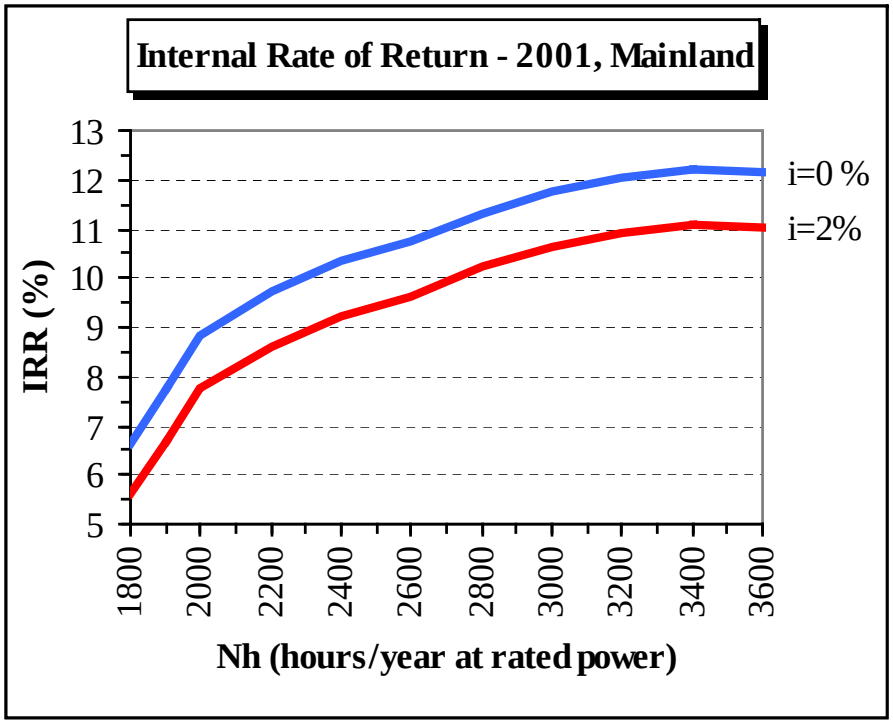
Reference profitability : example of 2001 wind tariffs





❑ Reference case

⇨Yearly O&M expenses: Kom = 4 % of initial investment

⇨Mean inflation rate 2001 - 2015: i = 0% or i = 2 % / year

⇨PI = NPV/I = Profitability index = NPV per € invested

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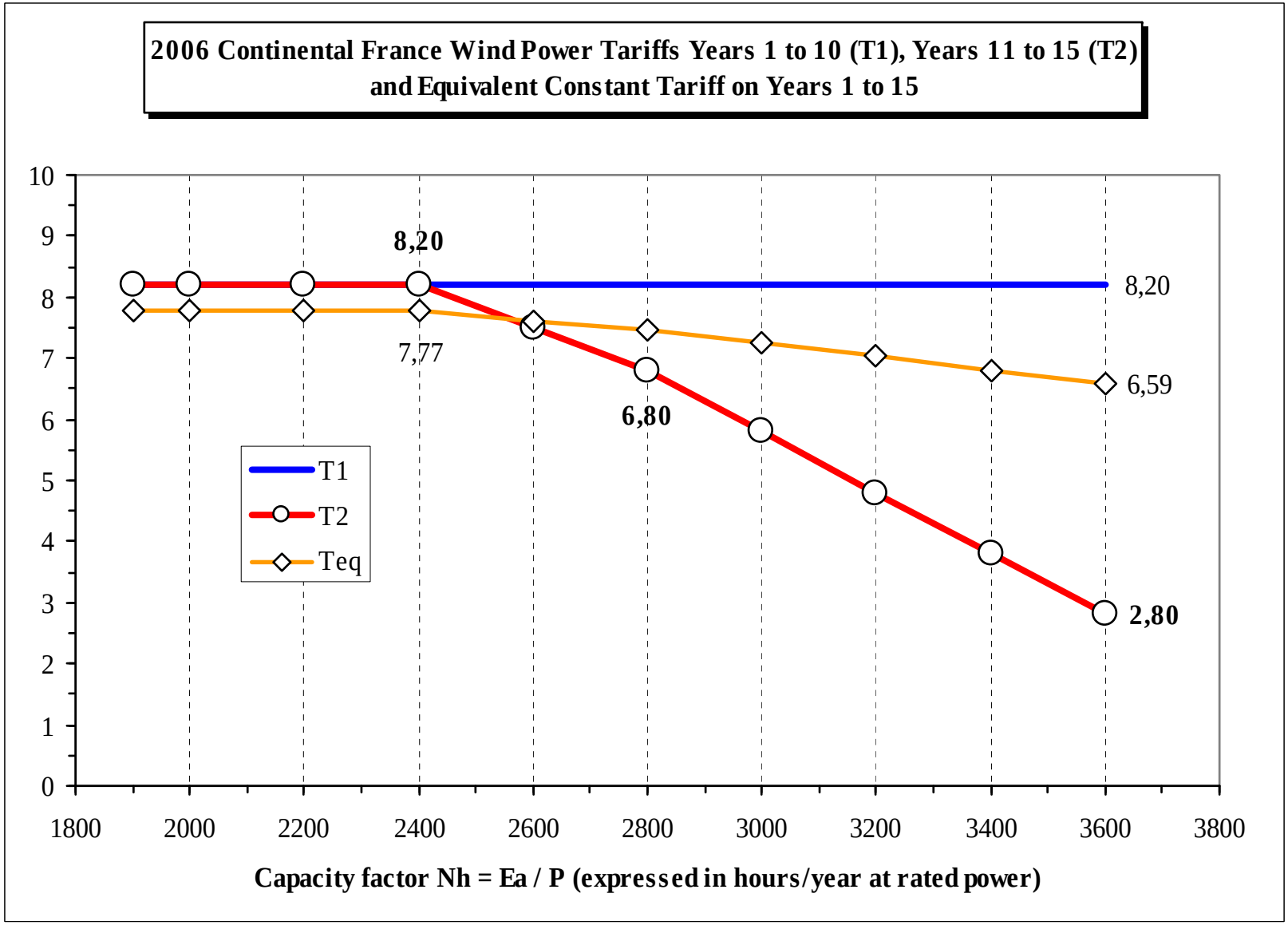
July 2006 onshore wind power tariffs



Equivalent constant tariff TVeq are calculated here with a 6 % real discount rate and a 2 % inflation rate

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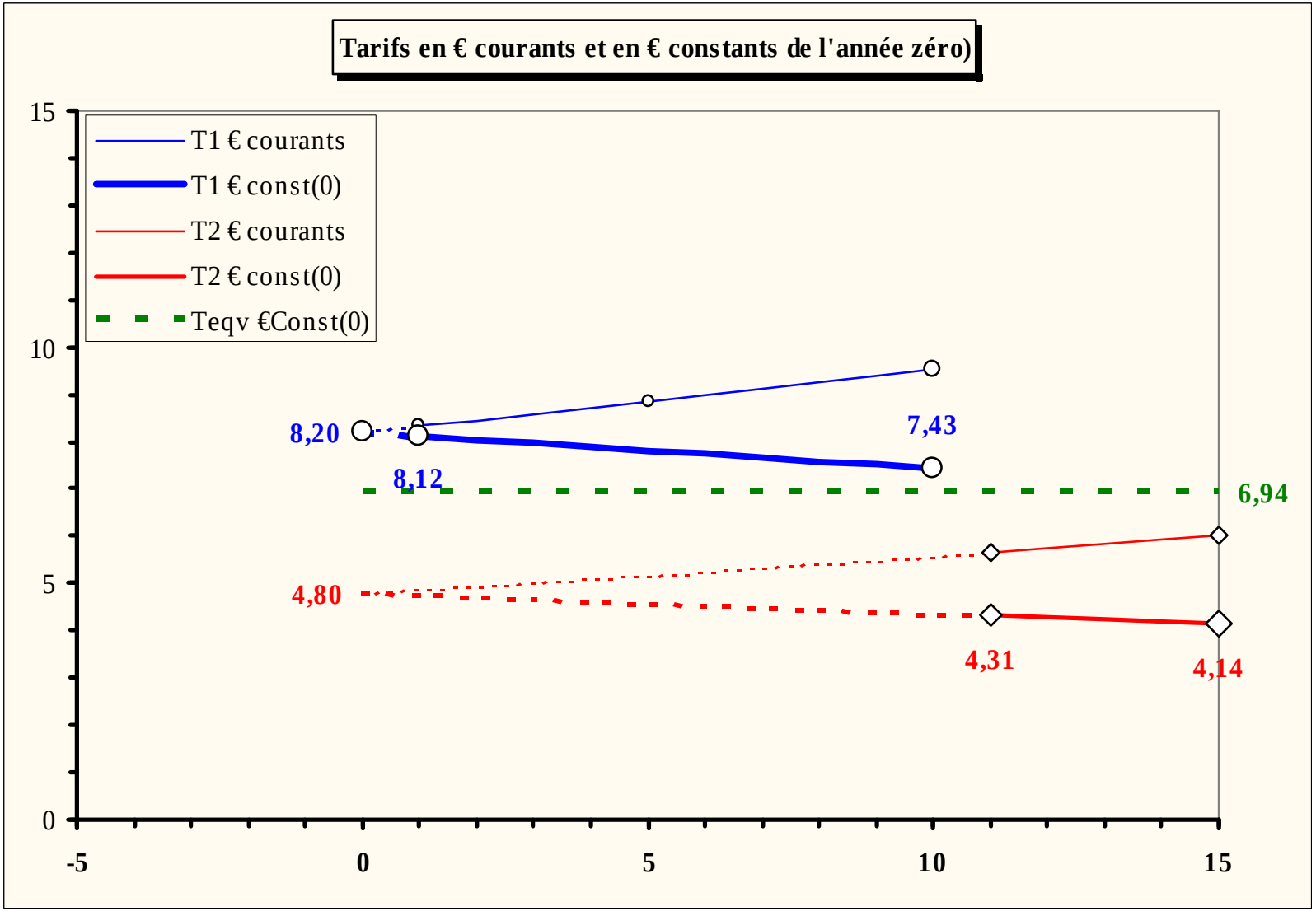
Example of a 2006 onshore wind power tariff

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



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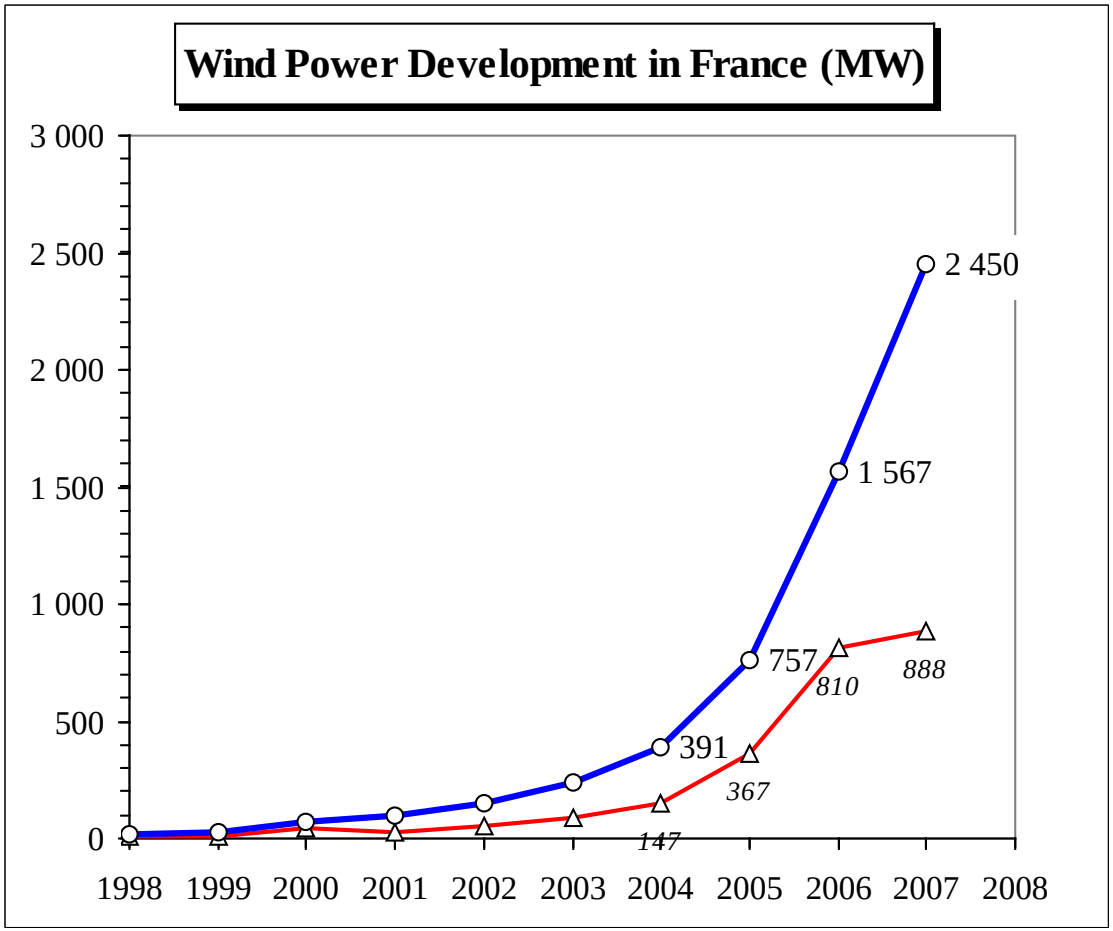
French Wind Tariffs are Efficient

- **France was in 2007:**
  - ⇨N° 8 wind capacity (world)
  - ⇨N° 5 wind market (third in EU)
- **Jobs created:**
  - ⇨ < 100 in 1993
  - ⇨Around 1000 in 2000
  - ⇨Around 5000 in 2007
  - ⇨Towards 10 000 in 2010
- **FITS over-cost passed on electricity consumer**
  - ⇨Based on the difference between FIT and electricity market price
  - ⇨< 5 % of public service charges
  - ⇨Less than 0.6 €/familly in 2007



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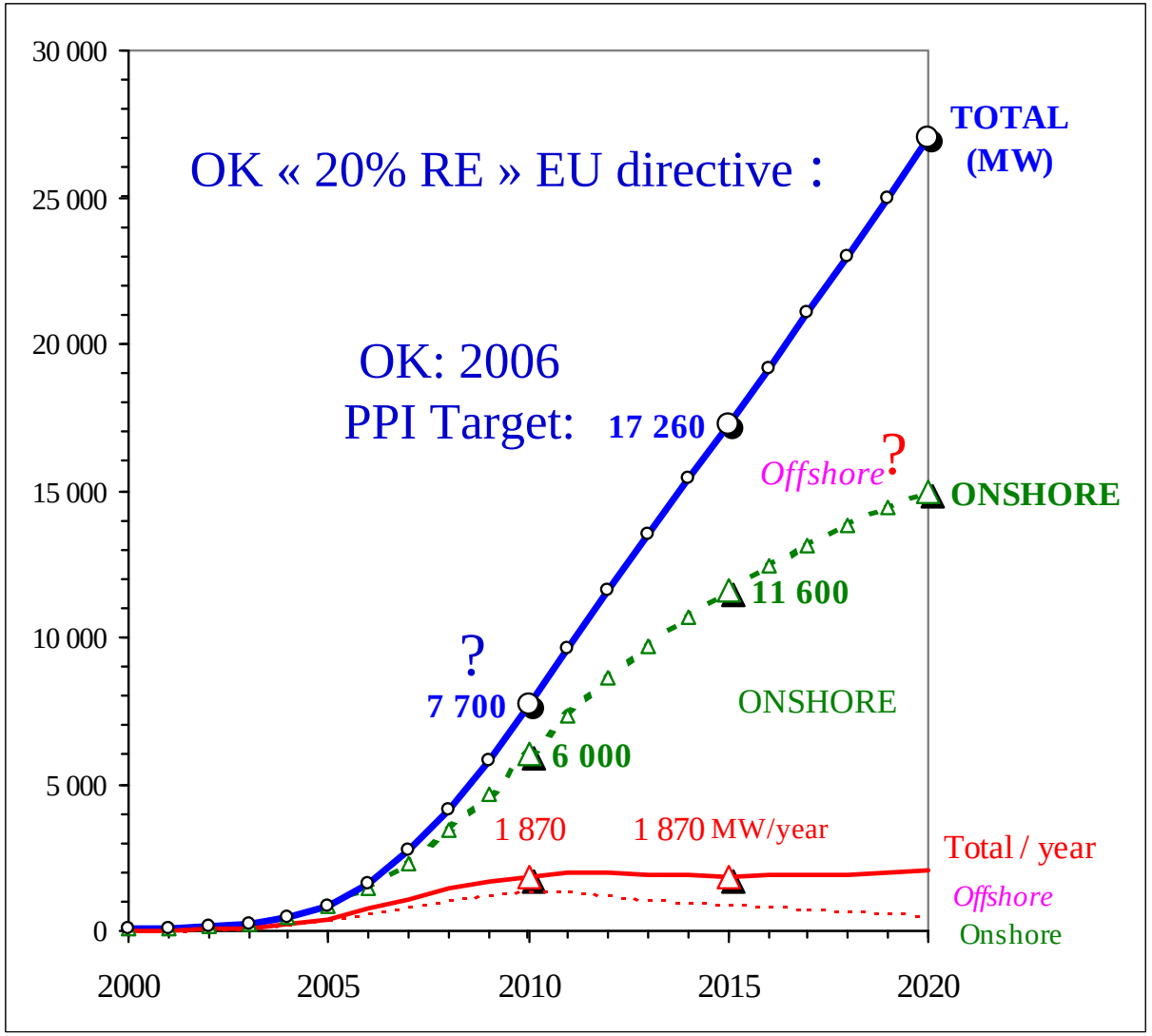
2003 anticipated development still valid for 2015-2020



Source: B. Chabot, ADEME, Husum Wind 2003

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Example of a Rational Design of a Wind Power Tariff System

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Appropriateness between targets and profitability levels

❑Preliminary definition of targets

- ⇨Increase of operating power and electricity production on 5 and 10 years
- ⇨Quality of potential wind sites : **Vwind min, Vwind max**

❑Defining fair ad efficient profitability targets

- ⇨From global projects economic profitability before tax
- ⇨**Interest of the universal Profitability Scale based on Profitability Index**
- ⇨Profitability Profile on different sites
  - ✯Minimum profitability on relevant less windy sites
  - ✯Maximum profitability on relevant more windy sites
    - ➔ Avoids windfall profits on those sites, limits wild competition for the access to those sites
    - ➔ Gives the priority signal to develop those sites (reducing kWh cost on short term)
  - ✯Intermediary profitability levels :
    - ➔ Continuity of profitability profiles = f(Vm)
    - ➔ Checking that geographical zones which should deliver most TWh give a sufficient profitability

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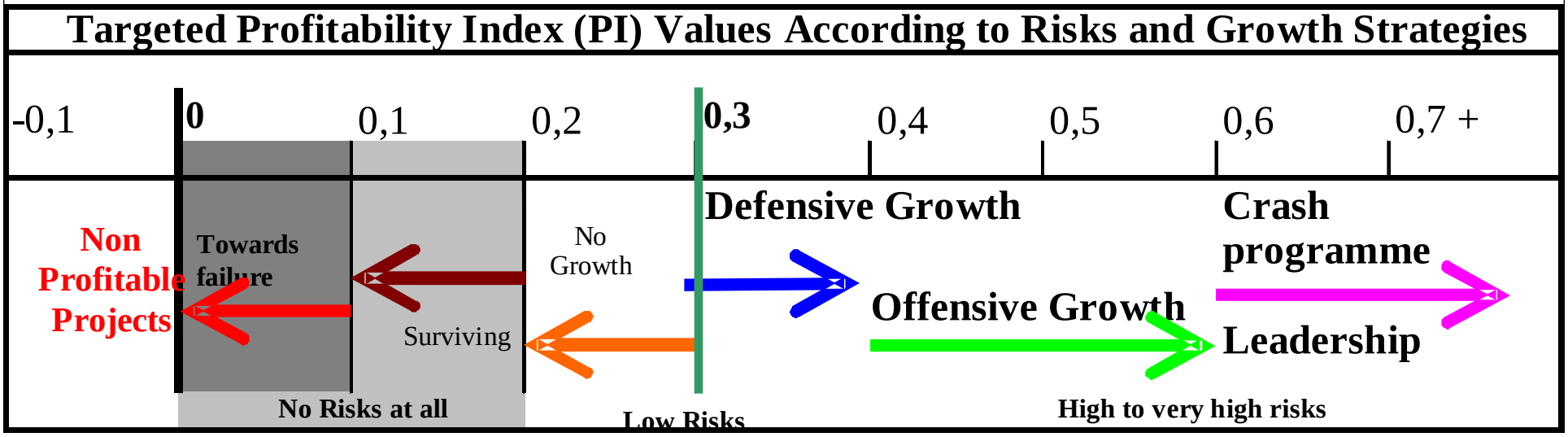
Example of profitability target choice

- Using the Universal Profitability Scale based on the Profitability Index PI=NPV/I

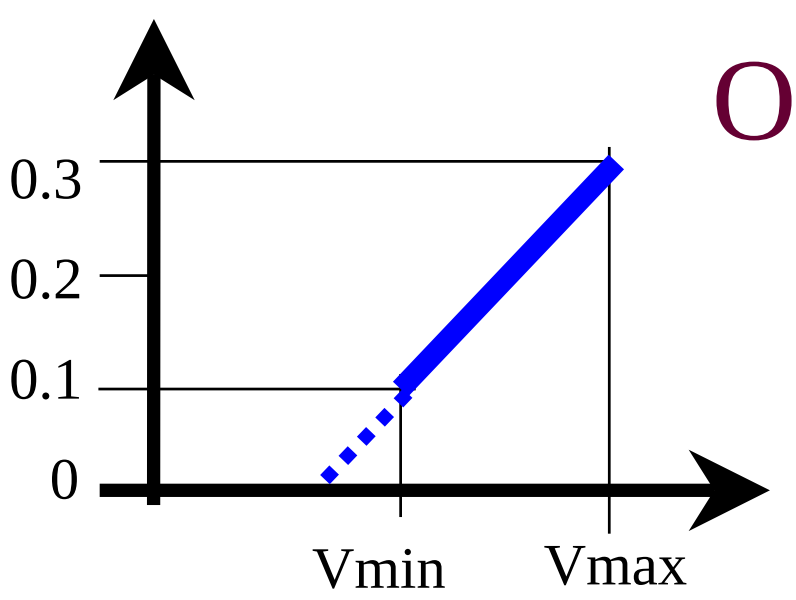


Zones to chose for wind power

Examples of profitability profiles versus quality of sites

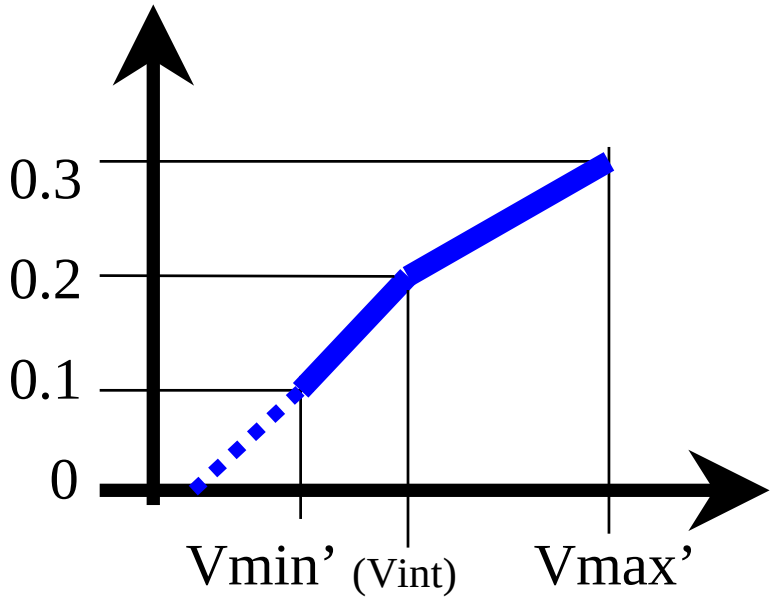
- **Advantage of using Profitability Index PI: directly proportional to NPV**
- **Performance criteria for wind power:**
  - ⇨Eas = Ey / S (kWh : m2.year)
  - ⇨Better than Nh = Ey / P (h/year)

PI = NPV / I



Or:

PI = NPV / I



Profitability from targeted equivalent constant tariff Tce

- **Direct calculation from the targeted PI level and ratios :**
  - ⇨ **Tariff : Tce = { (1 + PI) * CRF(t,n) + Kom } * Ius / Eas**
  - ⇨ **Tce expressed in constant $ of year (0)**
- **Definition of ratios:**
  - ⇨ **Tce** : constant required tariff (in constant $ of year zero) which will deliver the targeted profitability level expressed in PI = NPV / I
  - ⇨ **Eas** = Ey / S (kWh/m2.year) with Ey = annual energy sold
  - ⇨ **CRF**(t,n) = Capital Recovery Factor = t/{1-[1+t]exp(-n)}, t = discount rate = AWCC before tax
  - ⇨ **Ius** = I / S ($/installed m2 of swept area)
  - ⇨ **Kom** = Dom / I with Dom = yearly O&M expenses including provision for big repairs (for wind, typically Kom = 4 %)

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Conclusions

- Market regulation in favour of RE electricity is rational and is simple and effective if based on fair and efficient tariffs
- Benefits from this regulation are rapidly outweighing its cost
- France 2001 and 2006 Feed-In Tariffs confirmed as the main wind development driver
- Same growth dynamic created now for PV and Biogas with 2006 relevant tariffs
- Future French wind and other renewable policy from the new 20 % European target for renewables in 2020 will require a continuity in success, based on fair and efficient tariffs
- An extension of FITs for renewable heat is also under consideration in France
- Sharing experience, methods and tools can avoid delays and unnecessary or risky tests or trials for FITs systems designs