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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

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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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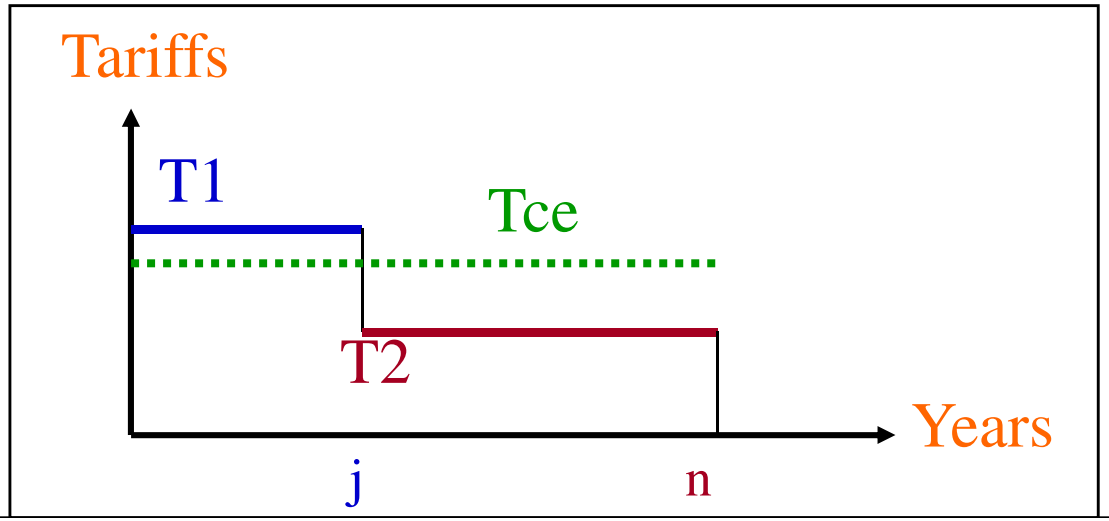
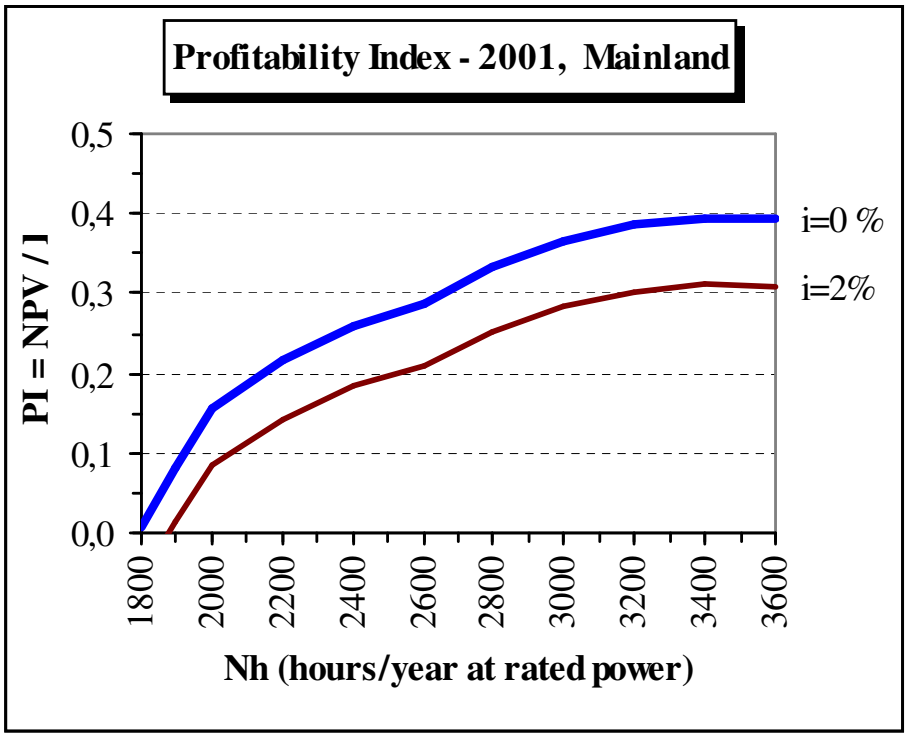
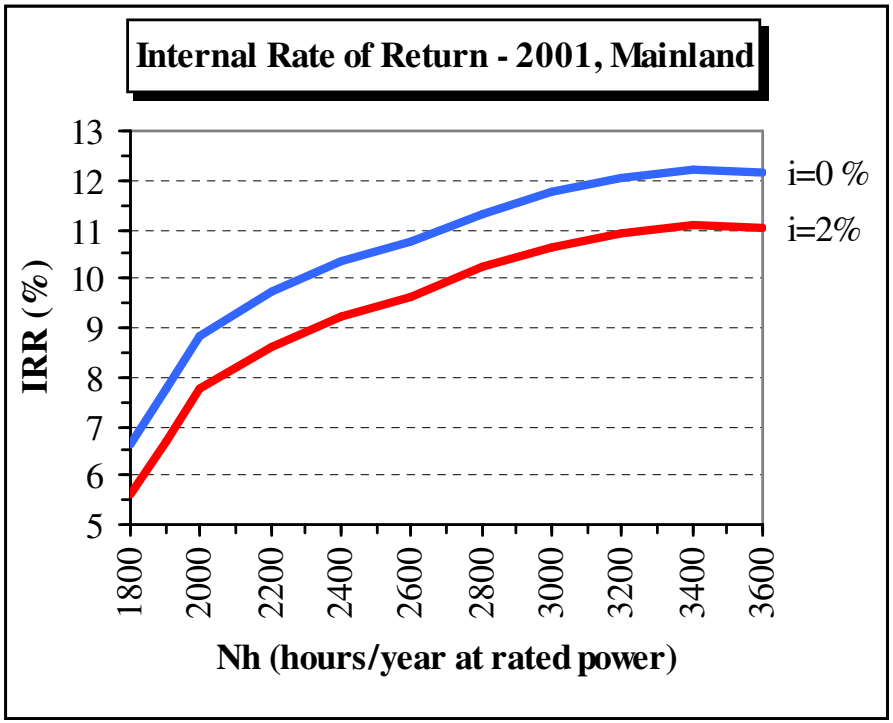
Example of the French onshore wind tariffs

- **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)



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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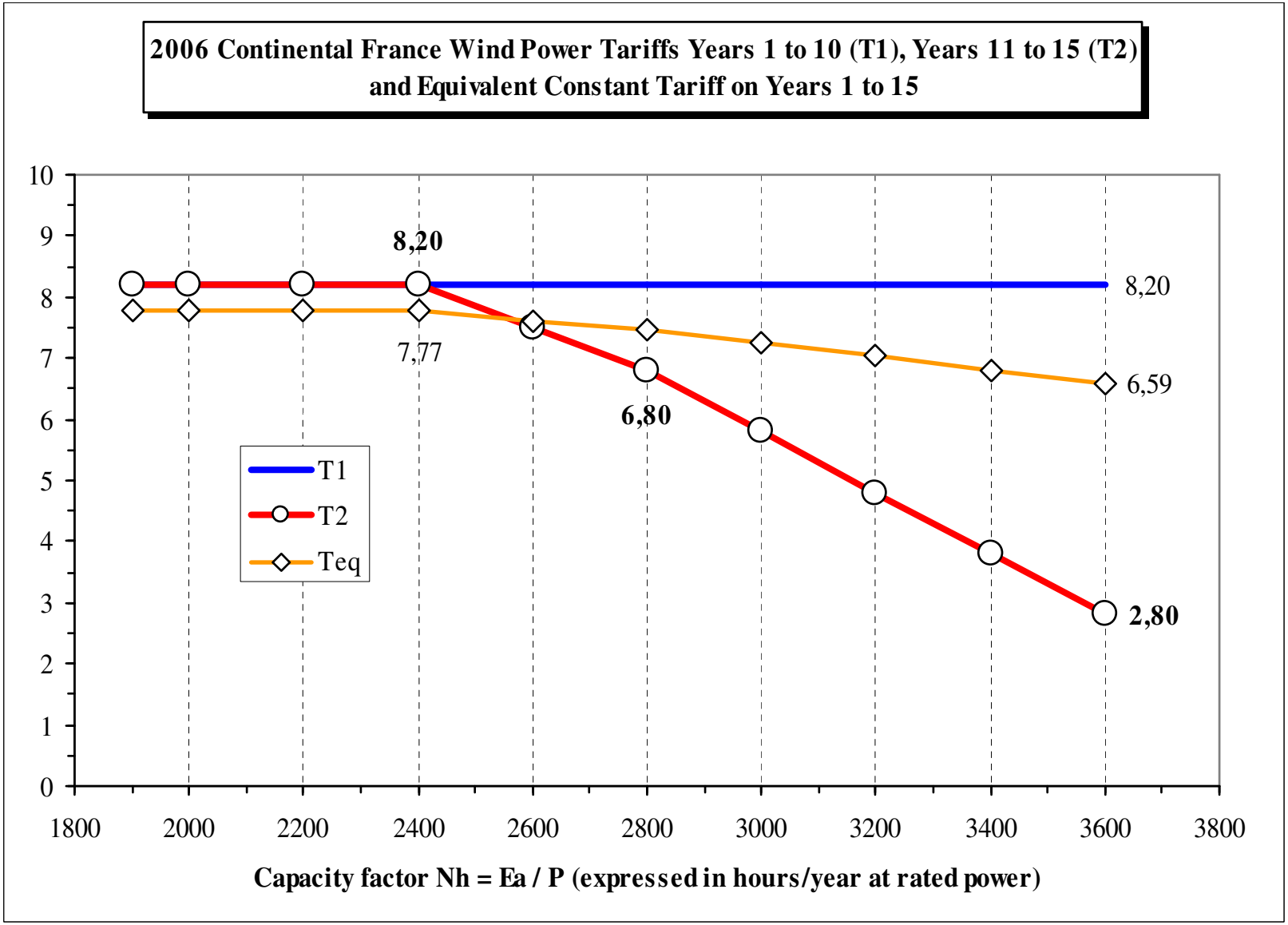
July 2006 onshore wind power tariffs



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

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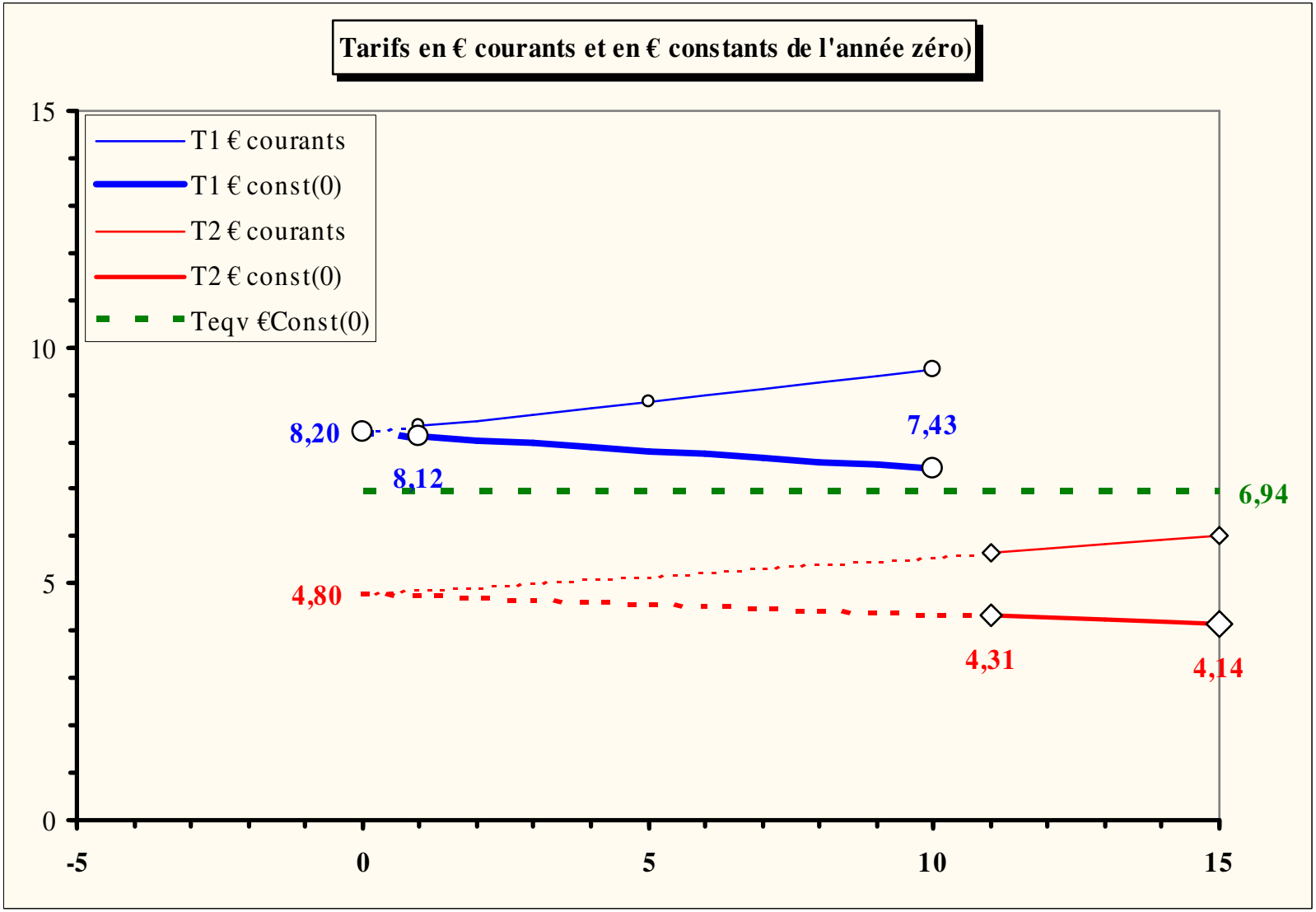
Example of a 2006 onshore wind power tariff

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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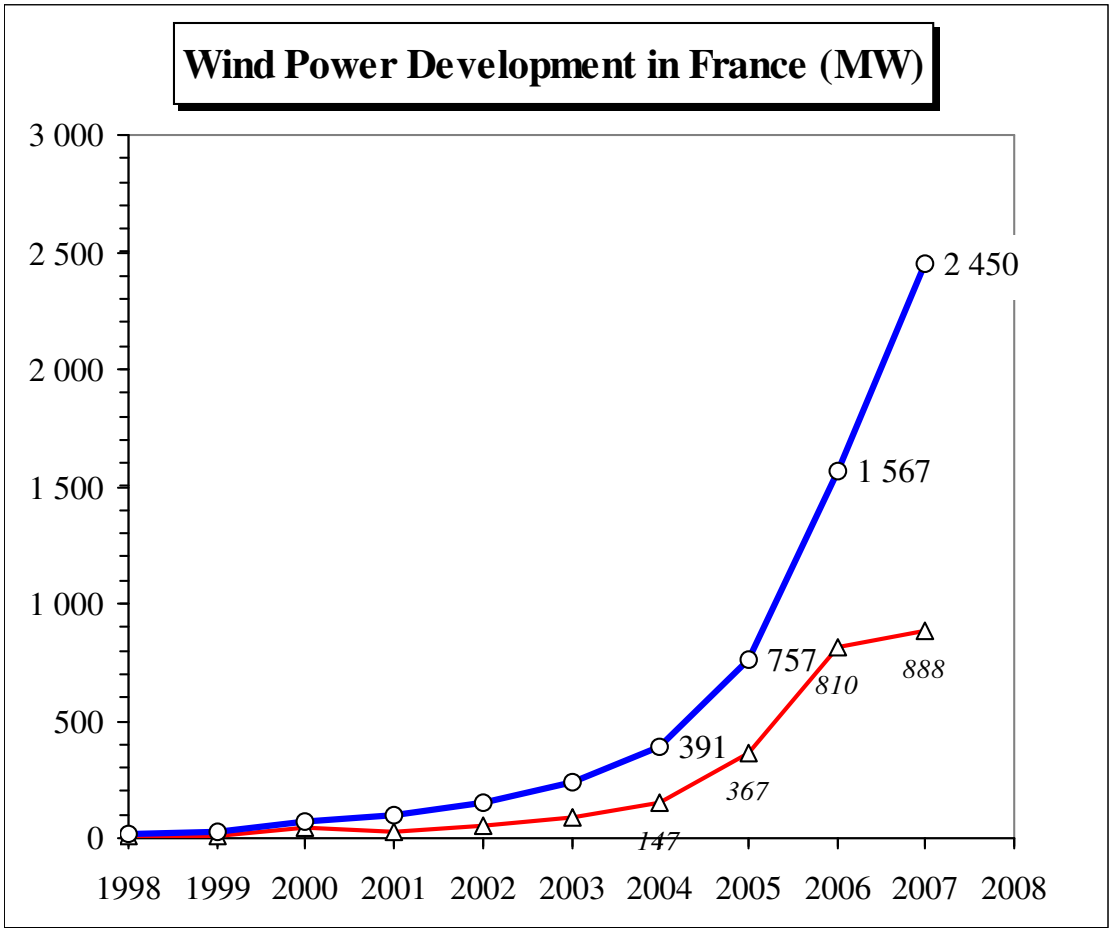
French Wind Tariffs are Efficient

- **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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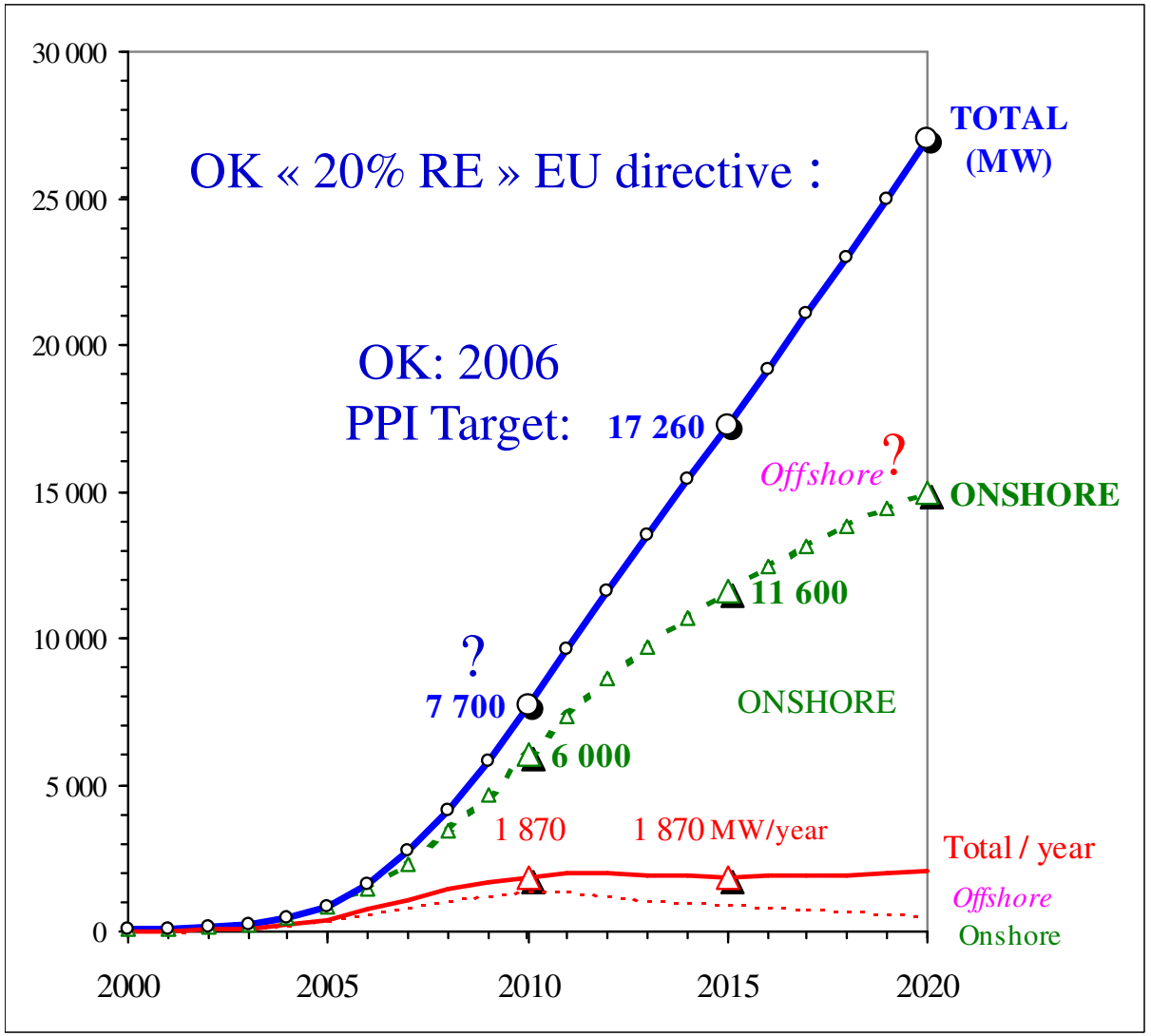
2003 anticipated development still valid for 2015-2020



Source: B. Chabot, ADEME, Husum Wind 2003

Example of a Rational Design of a Wind Power Tariff System

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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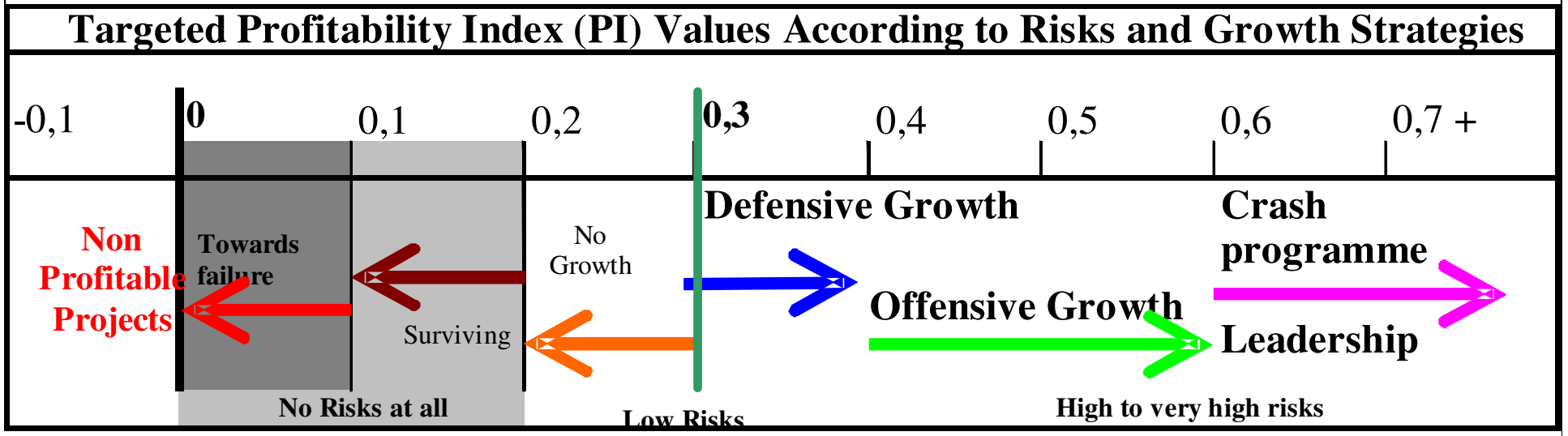
Example of profitability target choice

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



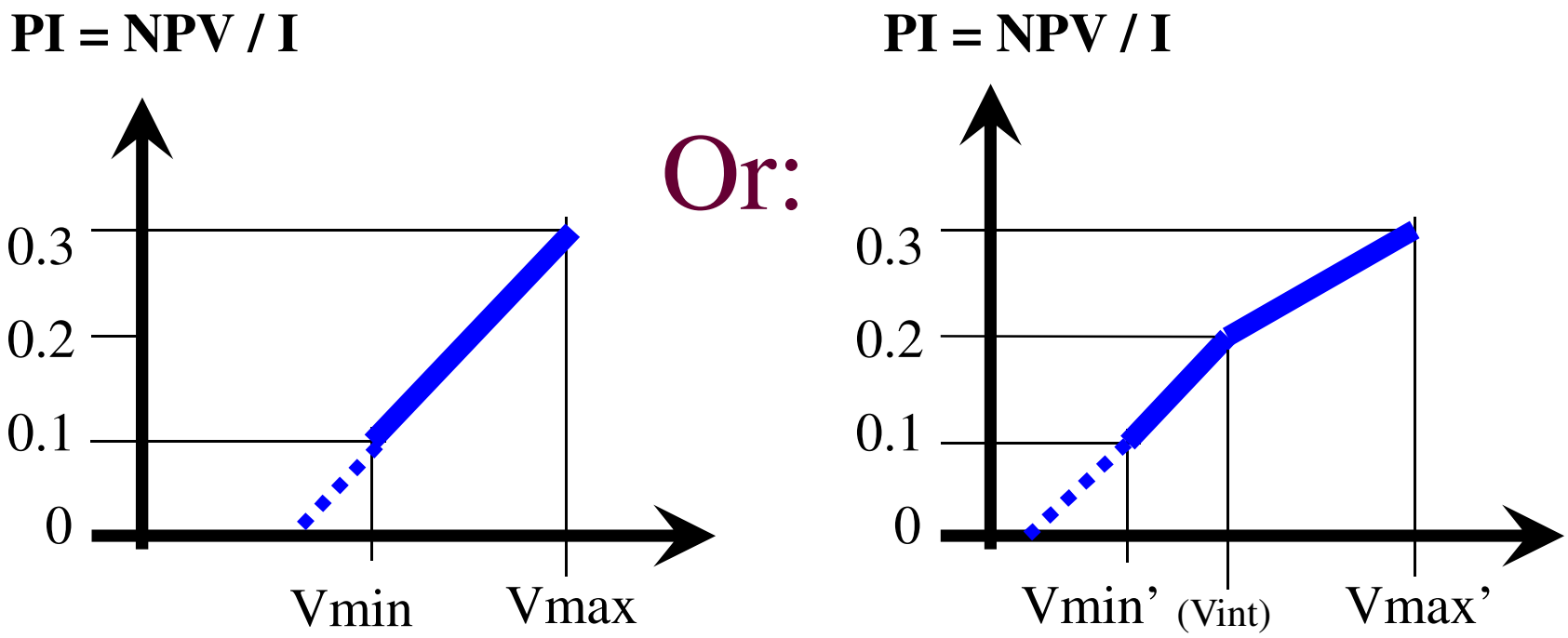
Zones to chose for wind power

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)



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