Long-term Technology Goals for CAEP

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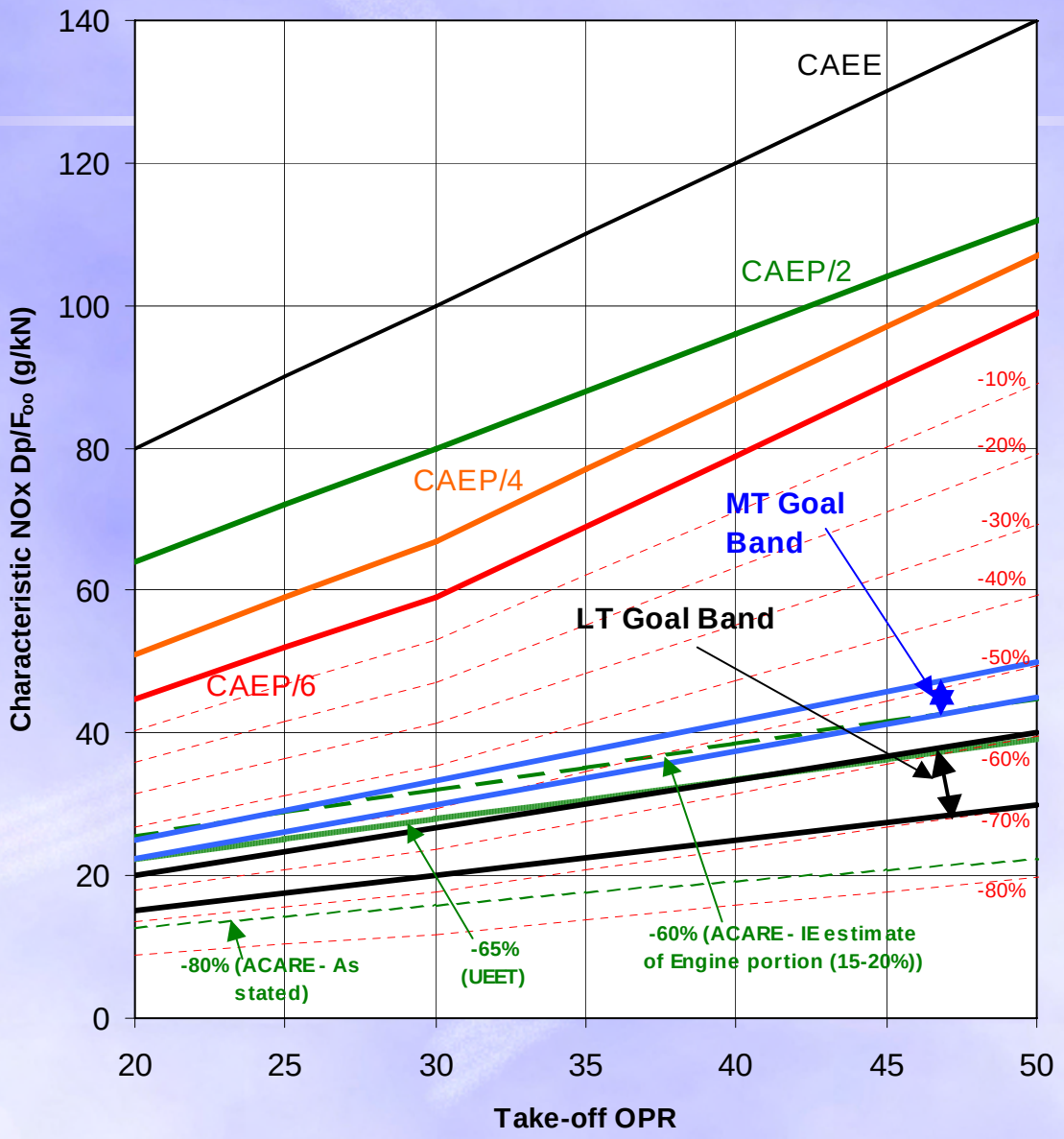
What are “technology goals”?

- Statements of industry capability to reduce emissions
- Result from independent assessment
- Defined in certification parameters
- Both long and medium term …..
- …..10 and 20 years
- First CAEP assessment

MT and LT goal Bands



Genesis

- Proposal that CAEP to be informed on possible future emissions reduction trends
- Policymaking needs long term view
- To be able to consider future possibilities for emissions improvements/standards
- Other views exist…..but CAEP needs its own…

Goal-setting practicalities

- WG3 emissions task
- CAEP remit – NOx only
- Goal definition agreed
- Linked to TRL levels
- Agreement to independent experts (IE)
- Technology Review process – strong Industry support
- Review schedule defined, report to CAEP

Review Details

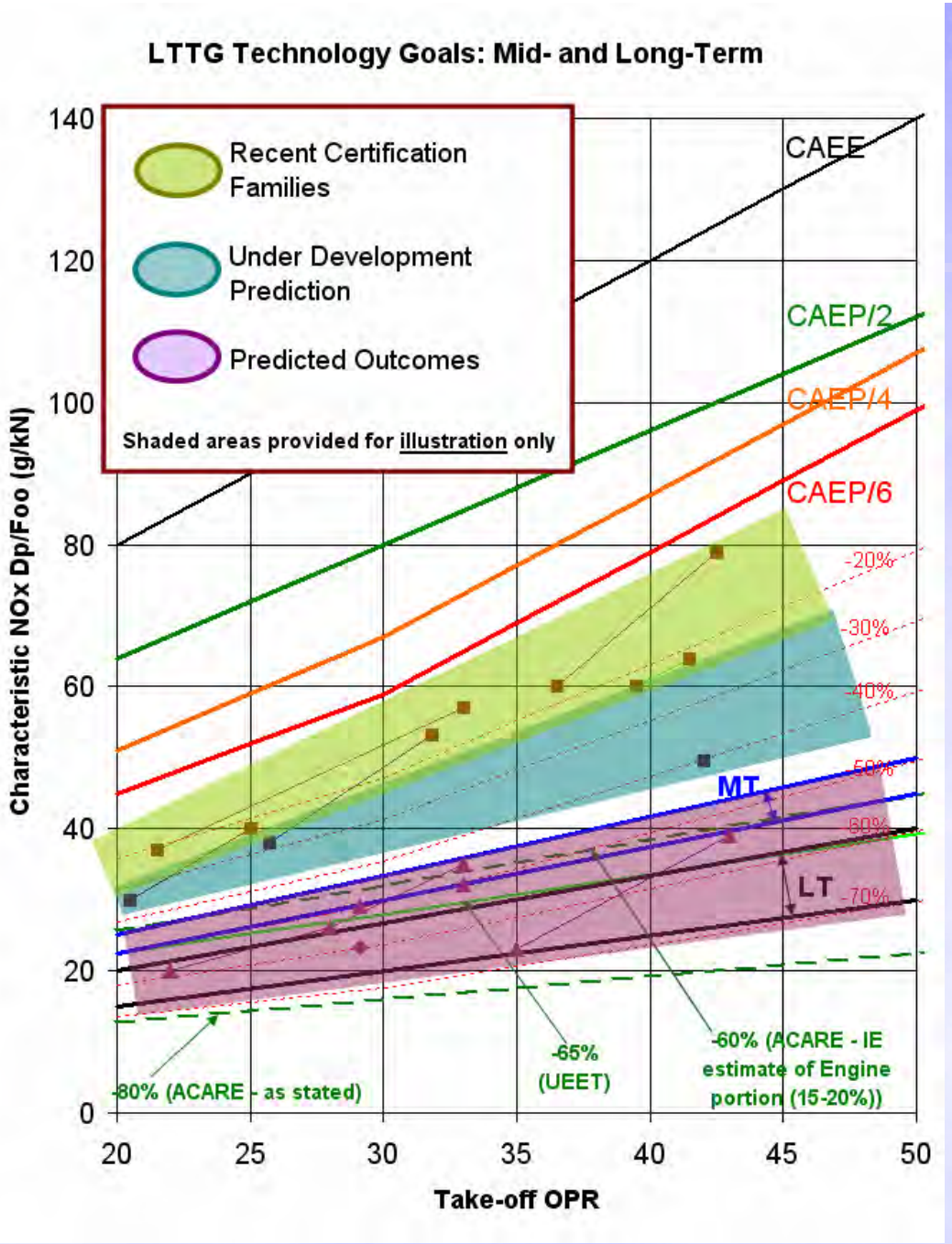
- Independent experts requested from interested states ……
- …..3 from US, 2 from UK, 2 from France*, 1 from Germany*
- IEs elected Chairperson
- Review Panel - members included industry
- Facilitation from UK and US
- Review hosted by UK (March 2006)

Technology Review

- Held in open forum
  - data presented was non-sensitive (RR, P&W, GE and Snecma)
- Scene-setting overview
  - Policy, NGO, Science, Research activities, Airline industry perspective
- Industry presentations:
  - Combustion technology “facts of life”
  - Recent certifications
  - mid-term results (evolution)
  - Long-term prospects (revolutionary)
- NO_x Goals defined by regulatory parameter

Outcome and Results

- Judgement
- Goal setting process “advocative and iterative”
- Valuable one-to-one discussions to refine information
- Consensus between IEs on goals
- Lessons learned
- Recommendations to CAEP


LTTG Technology Goals: Mid- and Long-Term
Recent Certification Families
Under Development Prediction
Predicted Outcomes
Shaded areas provided for illustration only
CAEE
CAEP/2
CAEP/4
CAEP/6
-20%
-30%
-40%
-50%
-60%
-70%
MT
LT
-80% (ACARE - as stated)
-65% (UEET)
-60% (ACARE - IE estimate of Engine portion (15-20%))
Characteristic NOx Dp/Foo (g/kN)
Take-off OPR
0
20
40
60
80
100
120
140
20
25
30
35
40
45
50

Outcome at CAEP/7

- Goals accepted
  - 45% and 60% below CAEP/6
- Report to be made openly available
- Progress towards goals to be monitored
- Goal-setting process will now be applied to:
  - Noise
  - Fuel consumption
  - Operational measures

How to use?

- Stringency – technology “push”
- Technology goals – technology “pull”
- Model inputs
- Trend analysis / impact assessments
- Monitoring progress – LT goals provide a framework to assess future progress
- Inform stringency debate
  - timing
  - range of options

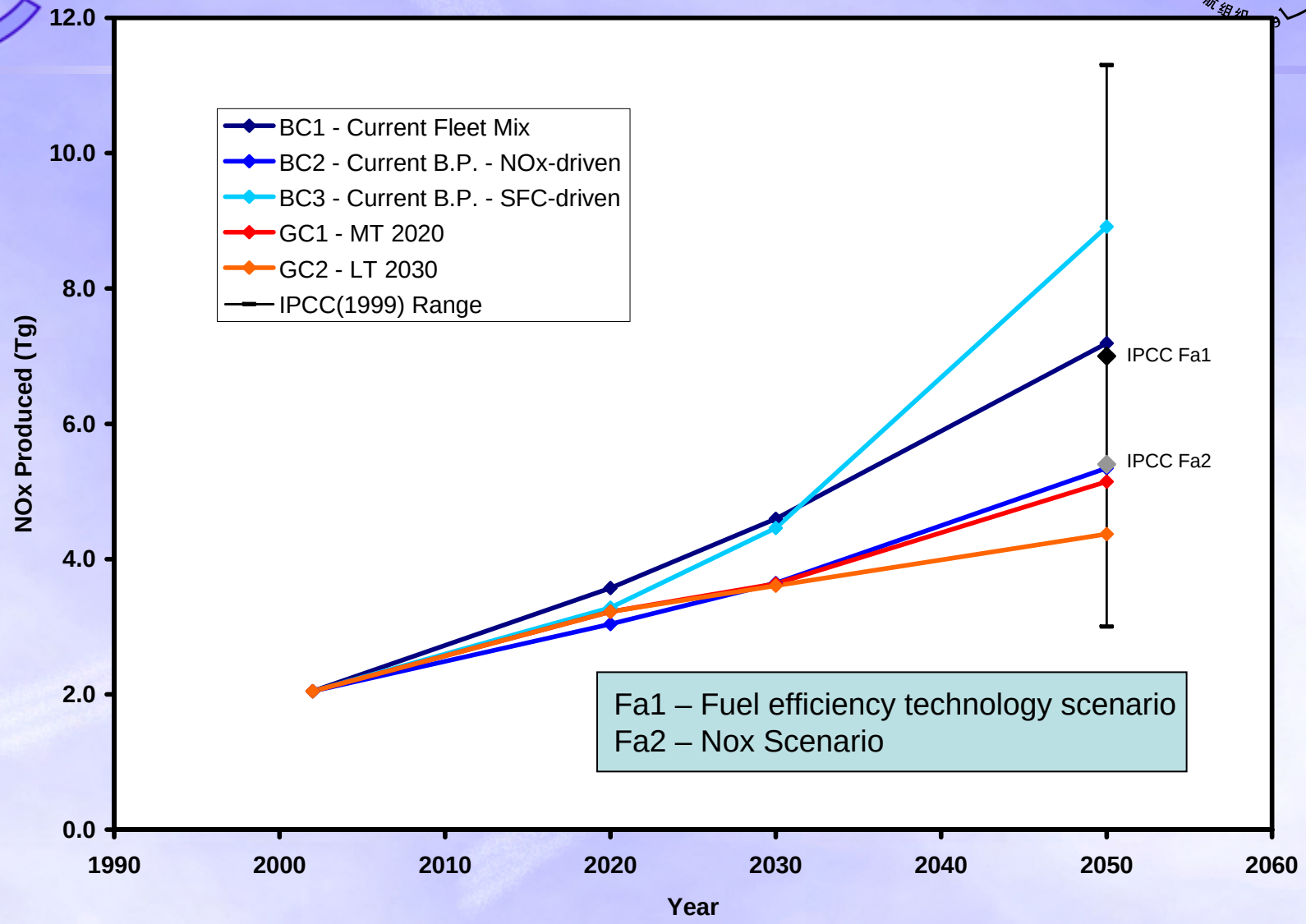
Implications for CAEP?

- Successful because of IE input
  - Independent view strengthens CAEP policymaking
  - Technology “audit” - added value
  - industry “contributing to its own agenda” in CAEP is avoided
  - Cost and resource issues?
- Independent experts <u>essential</u> for future goal-setting work

DTI Analysis of LTTG Goals (Qinetiq)

- 3 base cases and 2 goals cases – global fleet
- FESG Forecast, extrapolated to 2050, but scaled to reflect the same growth trend used for IPCC 1999
- 5 cases are:
  - Base Case 1 - Current fleet mix
  - Base Case 2 - Current best practice – No OPR change
  - Base Case 3 - Current best practice – 0.5 OPR increase per year (fuel efficiency)
  - Goals Case 1 - MT Goal available from 2020 – 0.5 OPR increase per year, and applied to the current best practice assumption
  - Goals Case 2 - LT Goal available from 2030 – 0.5 OPR increase per year, as GC1

Evolution of Global NOx Production



Conclusions

- NOx technology goals offer an independent view on emissions mitigation from technology:
  - Provide guidance for CAEP policymakers
  - Assist Industry with a framework to assess progress
  - Inform scope and timing of future regulatory change
  - Assist emissions trend analysis, especially over the long term
  - Inform a definition of “environmental need”

Many thanks……

…….any questions?