Wind Farm Impact Update

Emergency Manager/Media
Spring Workshop

March 6, 2010

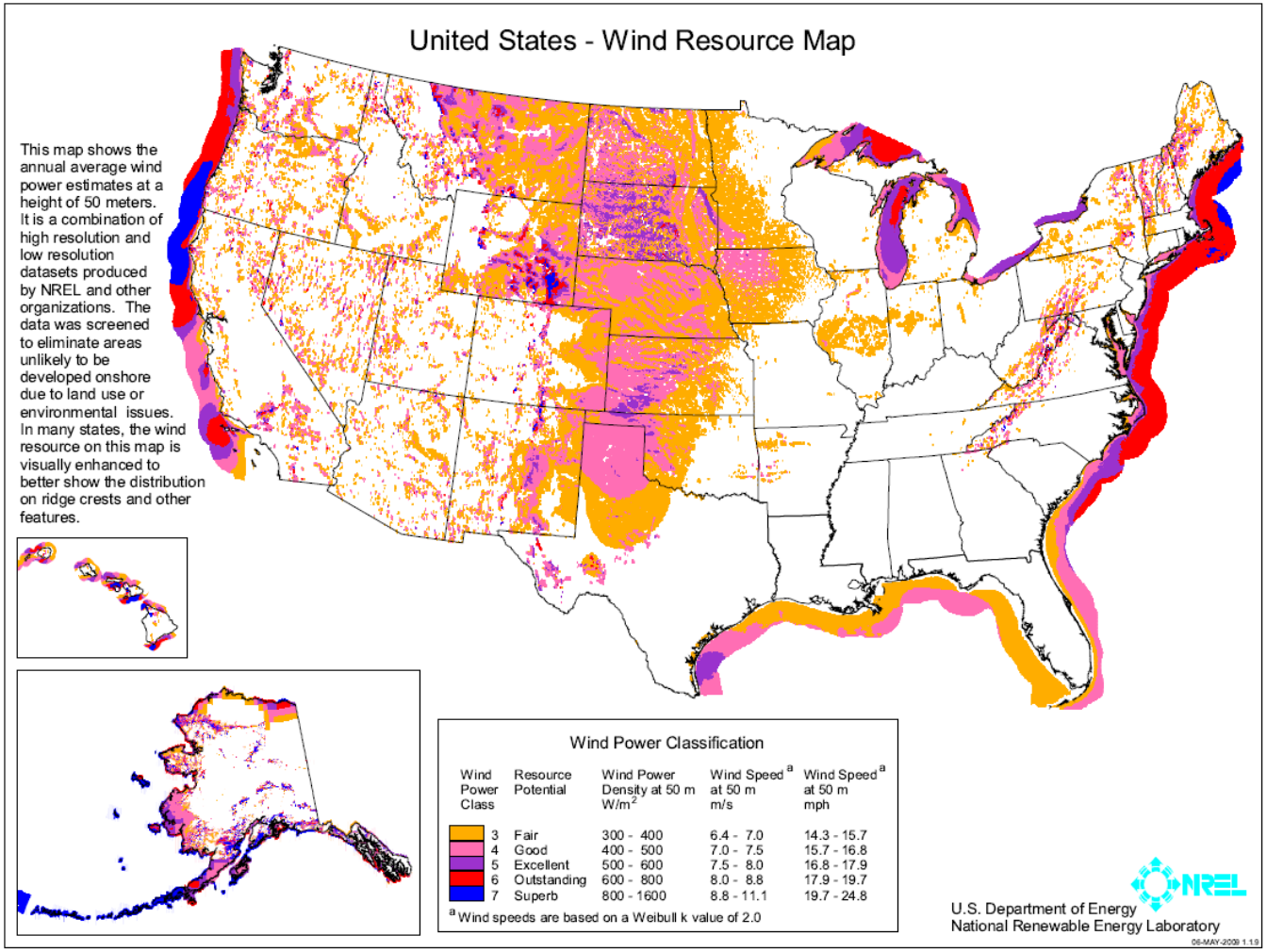
WSR-88D KILX Wind Farm Update

March 6, 2010

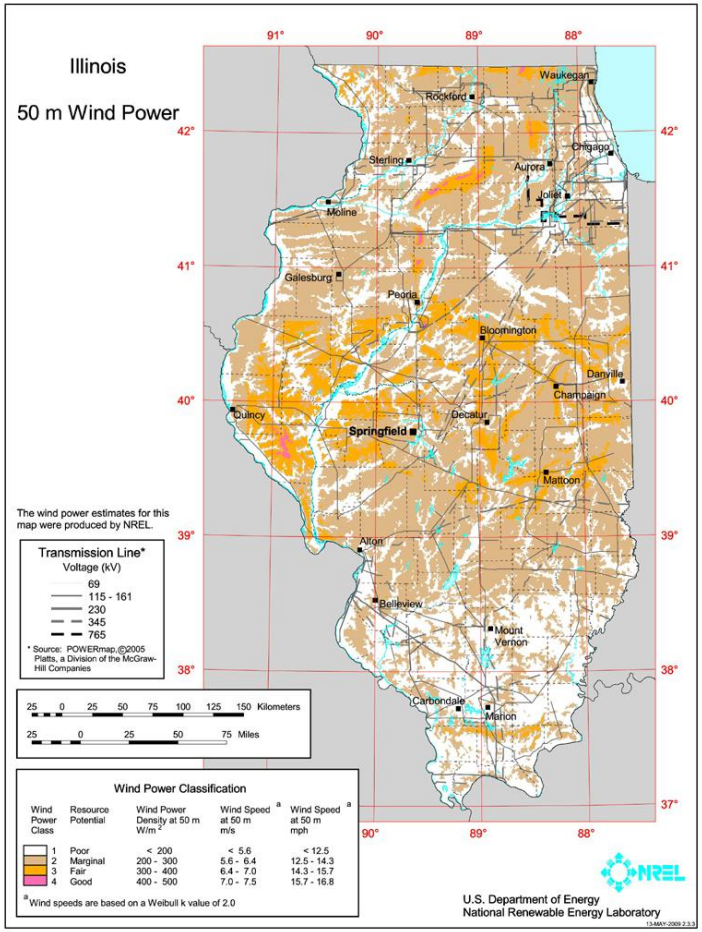
Wind Farms

- Wind farms are being promoted at all levels of government as a partial alternative to fossil fuel-based energy production.
- It is likely that many more wind farms will appear on the landscape of Illinois
  - Flat Terrain
  - Relatively High and Steady Wind Speeds
  - Nearby Customer Base
- The wind farm industry is extremely competitive and they can be somewhat hesitant to share information on proposed sites.

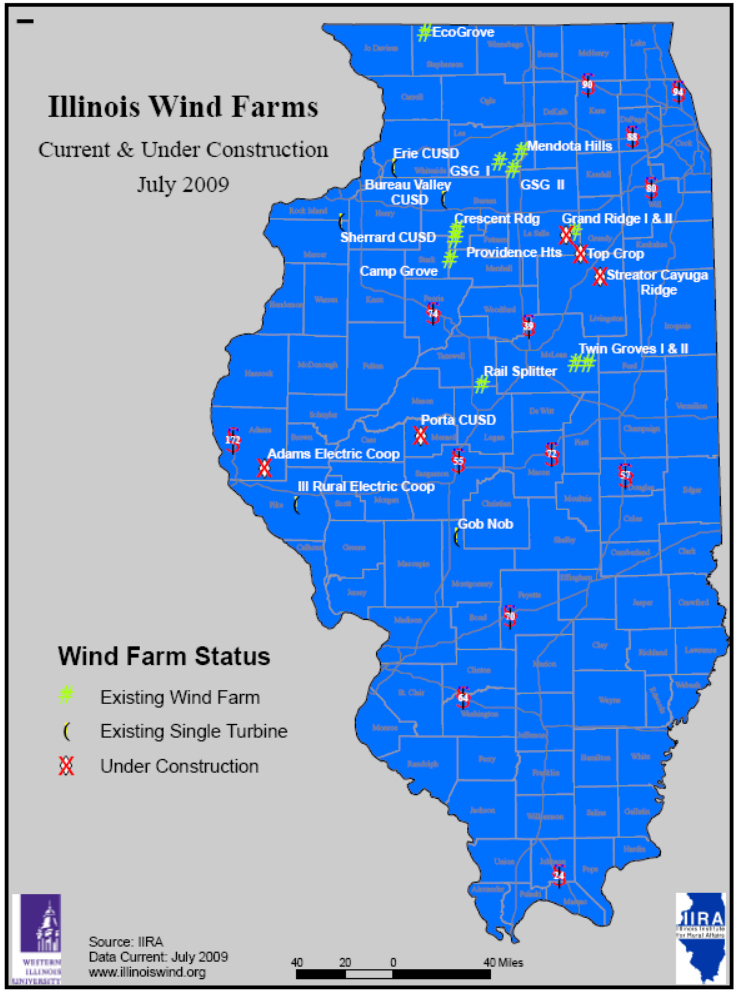
Wind Farm Potential – United States



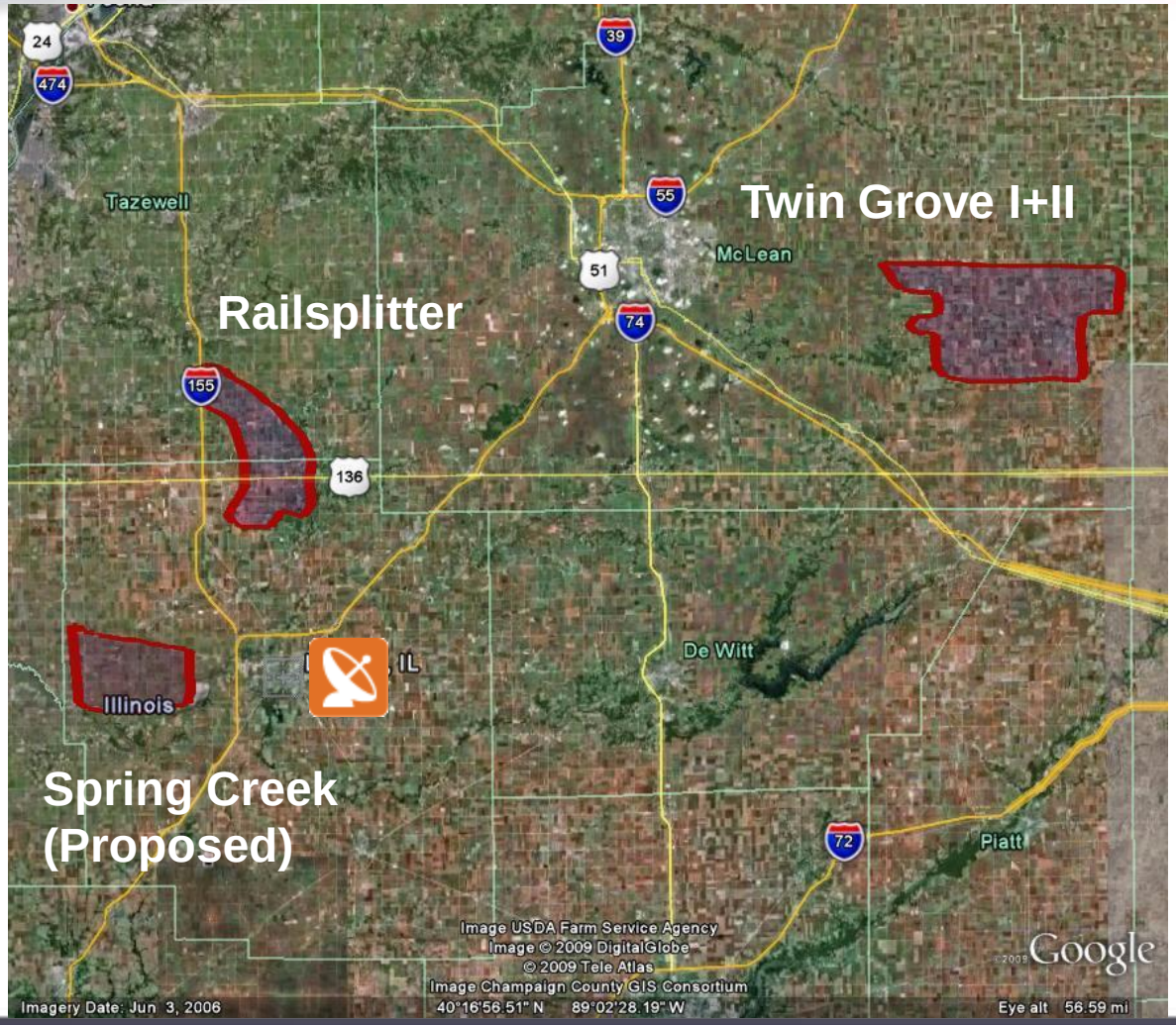
Wind Farm Potential - Illinois



Illinois Wind Farms



KILX Proximity Farms



Potential Impacts (Generic)

Based on their investigation and experience, the WSR-88D Radar Operations Center has identified the following impacts wind farms can have on WSR-88D data and forecast/warning operations:

- False or anomalously large radar-estimated precipitation amounts due to reflection from towers/turbines;
- False low radar-estimated precipitation amounts due to radar beam blockage;
- False echoes downrange from wind farms;
- Anomalously large reflectivity values due to reflection from towers/turbines;
- False storm identification due to reflection from towers/turbines;
- Incorrect velocity values due to turbine interference;
- Incorrect wind velocity profiles; and
- Potential blockage of low-level tornado/severe weather signatures due to blockage from towers/turbines.

Why do Wind Farms have a Significant Impact on Radar?

Railsplitter Wind Farm

- When Fully Operating:
  - 67 Turbines
  - Distance Range 8.7 nm – 14.4 nm
  - 18 Degrees of Azimuth Directly Impacted
  - Built at a cost of $200 M.
  - Provide power to 30,000 customers

Potential Impacts (Specific)

- No two wind farms have the same effect. The effect depends on distance, topography, height, orientation, size, and atmospheric conditions
- What we do know:
  - The towers and blades are in the direct path of the 0.5 degree and 0.9 degree scan.
  - During certain conditions, the farm will likely be in the beam path as high as 1.5 degrees as well.

Sugar Creek Wind Farm (Proposed)

- When Fully Operational:
  - 114 Turbines
  - Distance Range 6.7 nm – 13.8 nm
  - 25 Degrees of Azimuth Directly Impacted
  - Built at a cost of ???.
  - Provide power to 70,000 customers
- Additional Impacts:
  - Likely to have Anomalous Spikes as far as 18 nm Downstream at 0.5 and 0.9 Degrees

Sugar Creek Wind Farm (Proposed)

- Developmental and Operational Partners have been willing to consider mitigation options.
- Learning from one another.
- Discussed turning “off” the farm during hazardous weather.
- Next meeting we are scheduled to demonstrate how we utilize the information.

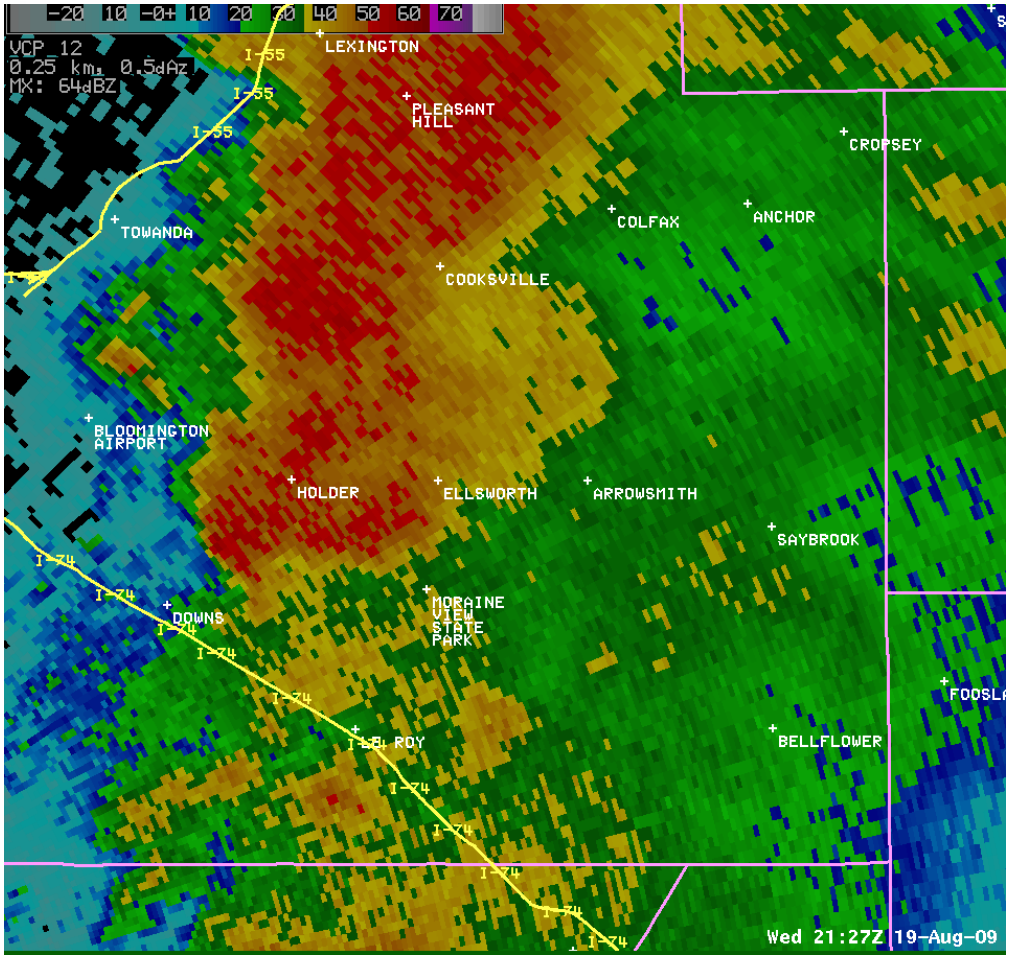
Potential Impacts

- Wind turbine contamination will cause the radar's precipitation estimation algorithms to generate false and anomalously large rainfall/snowfall/icing accumulation estimates over the facility.
- Wind turbine contamination of the Doppler velocity data in the area of the wind farm will degrade the performance of the Velocity Dealiasing Algorithm and may cause the Tornado Detection Algorithm and/or Mesocyclone Detection Algorithm to miss detections or generate false alarms in the vicinity of the facility.
- Composite Reflectivity products will have anomalously large values near the wind energy facility; the Storm Tracking algorithm may falsely identify storms or provide incorrect storm track forecasts in the vicinity of the facility.
- A "shadowing" effect will occur down radial of the farm for an unknown distance.

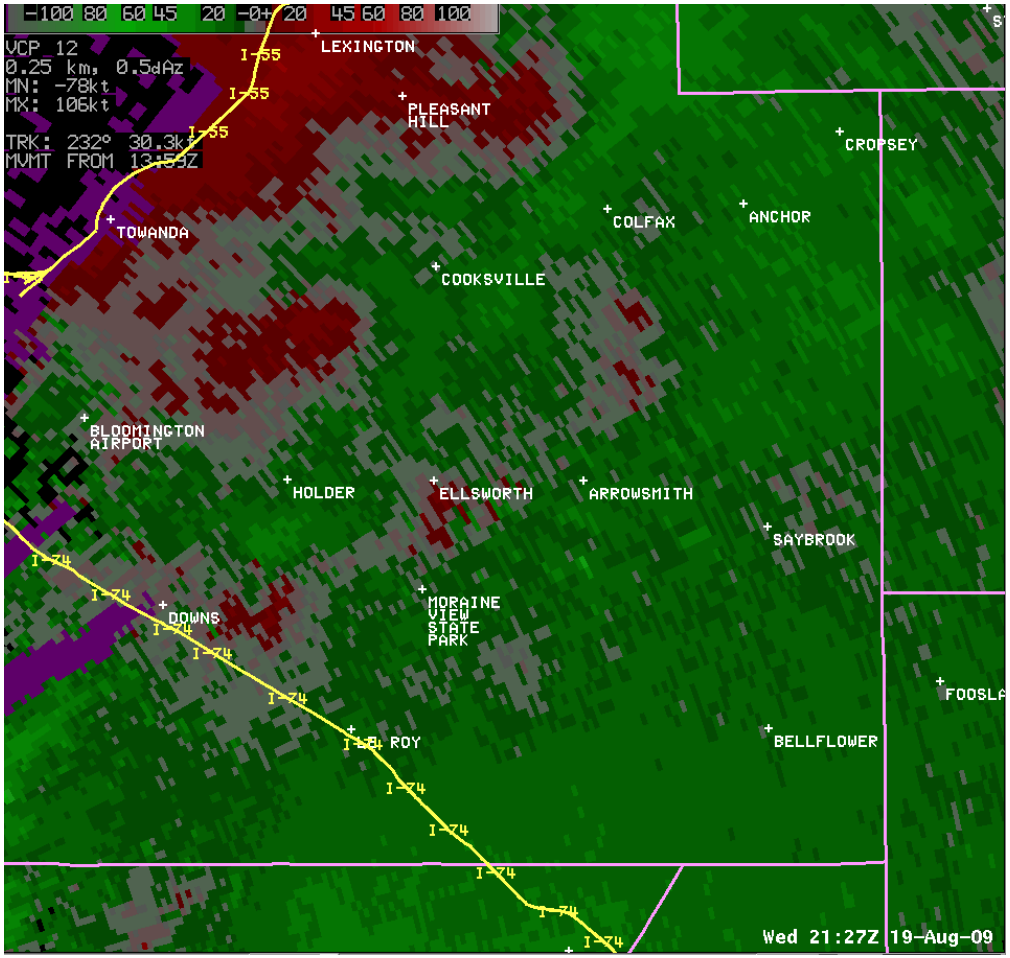
Holder Tornado Approaching Twin Grove Wind Farms

Photos by Mark Sefried

Holder Tornado – Reflectivity Loop



Holder Tornado – Storm Rel Vel Loop



We Need to Keep in Mind

- When a thunderstorm or winter storm moves over the wind turbine clutter, the storm characteristics could be masked or potentially misinterpreted, particularly in the vicinity of the facility and potentially downrange of the facility.
- Situations of turbine clutter contaminating the Doppler velocity data in the area of the turbine clutter area and possibly downrange, creating false signatures, could disrupt situational awareness particularly during hazardous/severe weather events.
- If weather develops (particularly thunderstorms) over the wind turbine clutter area, they may be difficult to initially detect.
- False precipitation estimates could negatively impact ability to warn for flooding.

- It is unknown how far downrange from the wind energy facility the wind turbine clutter, partial blockage, and shadow effects will impact the radar data and may change from event to event.

What We Are Doing

- NWS will keep in mind the location of the wind turbines (e.g. Radar Overlays and Impact Examples) and adjust our awareness accordingly (See “We Need to Keep in Mind”).
- Document Impacts so our Radar Operations Center can effectively report on future sites.
- Participate in development of training.
- Participate in research (Oklahoma Univ.).

What We Can NOT do

- NOAA has no regulatory power. Only FAA and DOD must be consulted.
- There are criminal penalties for “grassroots” lobbying by government employees.

Looking Ahead…

- Discussions will continue with wind energy companies to share concerns and understandings.
- Still hope that Dual-Polarization upgrade to radar may provide some help.
- Oklahoma University is working under a DOE grant to look at algorithm development for radar mitigation
- In the Meantime…more turbines!

Other Impacts?

THE Sun 30p

Thursday, January 8, 2009 30p thesun.co.uk

MISSING BLADE RIDDLE

UFO HITS WIND TURBINE

4am prang at 300ft

A WIND turbine stood wrecked yesterday with one of its giant 65ft blades torn off — after it was hit by a UFO.

Locals were woken by the 4am smash after strange lights were spotted streaking towards the

EXCLUSIVE by VIRGINIA WHEELER

200ft tall generator on a wind farm.

Baffled power chiefs said of the smash in Coniabolme, Lincs: "We have a team investigating." There was no trace of the missing blade. A UFO expert said: "We are very excited."

Full Story — Page Five

Clobbered ... turbine yesterday

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192 PARKS TO CHOOSE FROM
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COLLECT TOKEN PAGE 26
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VOUCHERS: SEE 4-PAGE PULLOUT
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BEATRICE £15k CAR NICKED SEE PAGE 7