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Investor Day

Neurological Products Division

15th May 2014

Presented by Paul Skinner

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Customer needs

- Target market is Functional Neurosurgical Units.
  - These units require;
    - **High accuracy** – specific placement of devices into the brain
    - **High effectiveness** – reduced human error
    - **High efficiency** – health economic

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Examples of Neurosurgical procedures

- DBS - Deep Brain Stimulation
  - Placement of 2 electrodes into the Subthalamic Nucleus
  - Typically for the treatment of movement disorders such as Parkinson's disease
- SEEG – Stereoelectroencephalography
  - Treatment of Epilepsy
  - Replacing sub-cortical grids
  - Typically placing 12 to 16 electrodes
- Stereotactic Biopsy
  - Accurate removal of tumor sample for analysis
  - Minimise damage during procedure
- Intraparenchymal drug delivery
  - Delivery of drugs directly into brain tissue to circumvent the blood brain barrier in several types of brain tumours

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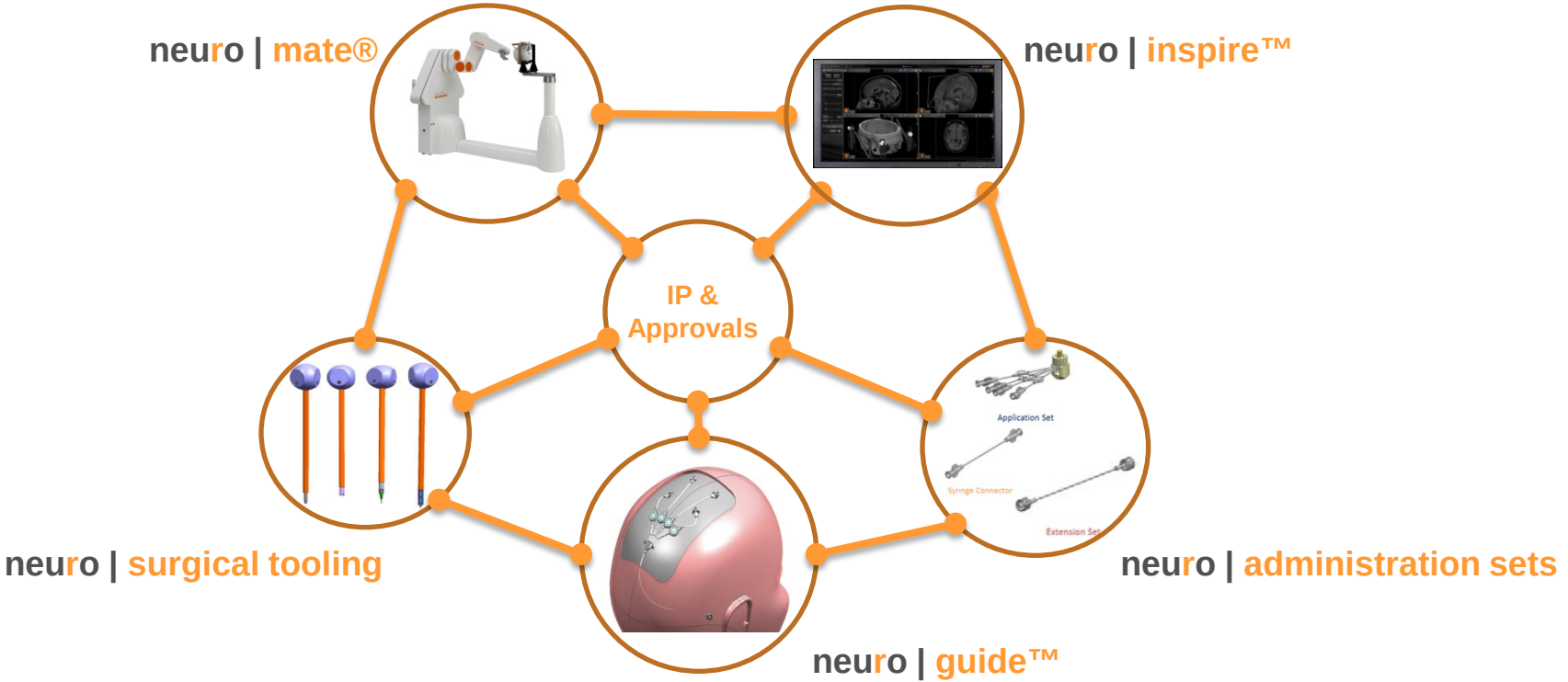
Engineering solutions – a systems approach



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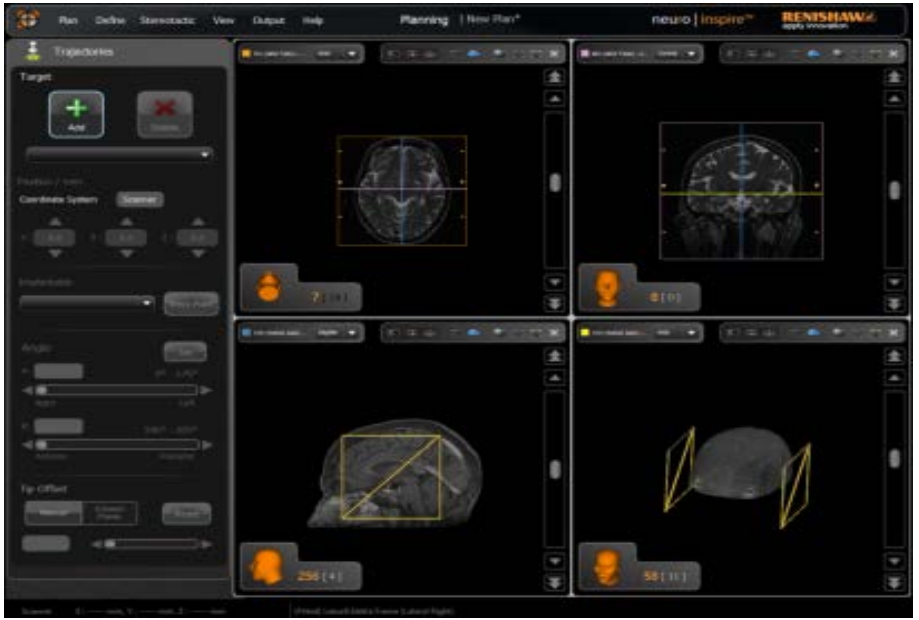
neuro I inspire™ surgical planning platform

- Rapid, accurate planning of stereotactic surgeries
- Multi-planar image reconstruction
- Brain atlas
- Intuitive planning process
- Detailed modelling of implanted devices
- Manual anatomy segmentation



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neuro I mate® stereotactic robot

- The first image-guided neurosurgical robot in the world
- Used in over 10,000 neurosurgical procedures
- More than 30 scientific peer-reviewed publications
- In use in leading neurosurgical centres in France, UK, Italy, Germany, Peru, Qatar, KSA and the US (R&D)

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Improved precision and increased speed*

Precision		Average	Range
DBS[2]	Frame	1.03 mm	0.62 mm - 1.44 mm
	Robot	0.81 mm	0.33 mm - 1.29 mm
SEEG[1]	Frame	1.43 mm	0.91 mm - 2.21 mm
	Robot	0.78 mm	0.49 mm - 1.08 mm
Speed		**Average**	**Range**
DBS[2]	Frame	55 min	+/- 17 min
	Robot	23 min	+/-13 min

*Compared to other stereotactic systems

1) Cardinale et al, Neurosurgery 72:353–366, 2013
2) Barua et al, Stereotactic Functional Neurosurgery 2013;91(suppl. 1): 1-334-Page 102

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neuro | guide™ DBS electrode delivery system

- Allows verification of expected DBS lead position relative to targeted anatomy using MRI data
- **Guide tube**: permanent implant bonded to the skull, electrode conduit
- **Stylette:** temporary implant for peri-operative MRI confirmation

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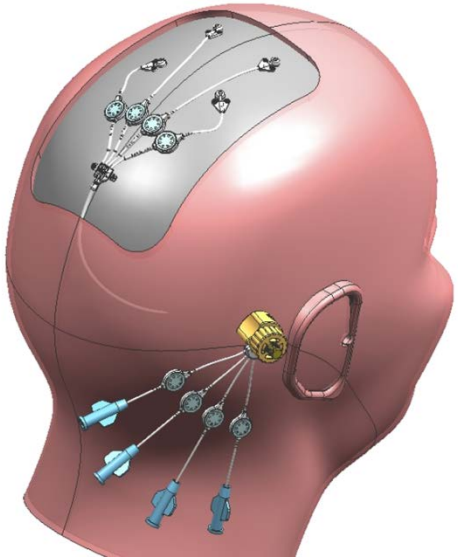
Drug delivery – support for Clinician led study

- Manufacturing an investigational intraparenchymal drug delivery system designed by an NHS Trust
- Clinician-led clinical trial for a therapy for the treatment of Parkinson’s disease
- This system has also been trialled by the Trust for delivery of a chemotherapy drug for the treatment of brain tumours



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Successful outcomes – Parkinson's Disease

- Example of a patient fitted with DBS electrode using the Renishaw *neuroguide™ and neuroinspire™* systems

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Successful outcomes - Epilepsy

- Stella (aged 13) developed severe epilepsy when she was 1 year old and subsequently endured up to 100 life threatening seizures every day.
- Over 10 years, she underwent 5 invasive surgical procedures, and after every procedure, the seizures returned immediately, often more violently.
- Their last hope was at the Niguarda Ca' Granda hospital in Milan, Italy where the neurosurgical team are pioneering the use of the Renishaw *neuromate*® stereotactic robot for the treatment of epilepsy (SEEG).

- Due to the precision and stability of the *neuromate* robot, they were able to reach parts deep in the brain that were not accessible through other methods, thus enabling them to identify the exact location of the brain that triggered her seizures. The identified section was then removed.
- Immediately after surgery, Stella's seizures stopped and she has been seizure-free now for 2 years. A truly life changing success story for the whole family.

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Thank you