

An Overview of South Australian Petroleum Systems

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ABSTRACT

South Australia is situated between the ancient Archaean Shield of Western Australia and the mobile orogenic belts of the eastern states. As a result of this tectonic setting, the geological record in South Australia has preserved a unique history of sedimentation from the Neoproterozoic to Ordovician, and from the Early Devonian to Tertiary. The basins may be subdivided as follows: 1. Mesozoic basins which either overlie older Early-Late Palaeozoic intracratonic basins or are developed on the rifted southern continental margin of Australia. These include the intracratonic Eromanga Basin and Southern Margin basins - Bight, Otway and Polda basins. 2. Permo-Carboniferous to Early Triassic basins which overlie early Palaeozoic basins in northern and southern parts of the state. These include the Arckaringa, Cooper and Pedirka basins. 3. Early Palaeozoic basins (Cambrian to Ordovician) include the Warburton, Arrowie, Stansbury and Officer basins. These overlie extensive Neoproterozoic sediments of the Adelaide Geosyncline and Officer Basin which are also prospective for hydrocarbons. Crystalline basement comprises Archaean- Mesoproterozoic metamorphic belts, volcanics and intrusives. The Cooper and Eromanga basins, which span Northeast South Australia and Southwest Queensland, comprise Australia's largest onshore petroleum province. Under-explored Permo-Carboniferous and younger sedimentary basins beyond the main producing region contain similar largely non-marine sequences in intracratonic settings. Extensive and thick Permian coal measures form important oil- and gas-prone source rocks. Continental margin basins on and offshore have very thick Cretaceous fill and include the Otway Basin, a proven gas province and the Bight Basin. In several instances there are identified mature source rocks for petroleum in lacustrine and marginal marine settings associated with reservoir sands. These occur not only in Permian and Cretaceous rocks, but also in basins with thick Neoproterozoic to Ordovician clastics and carbonates with additional source potential in marine settings. Unconventional reservoir plays are also being targeted including shale gas, shale oil, basin centred (continuous) gas, in situ gasification of coal and coal to liquids projects